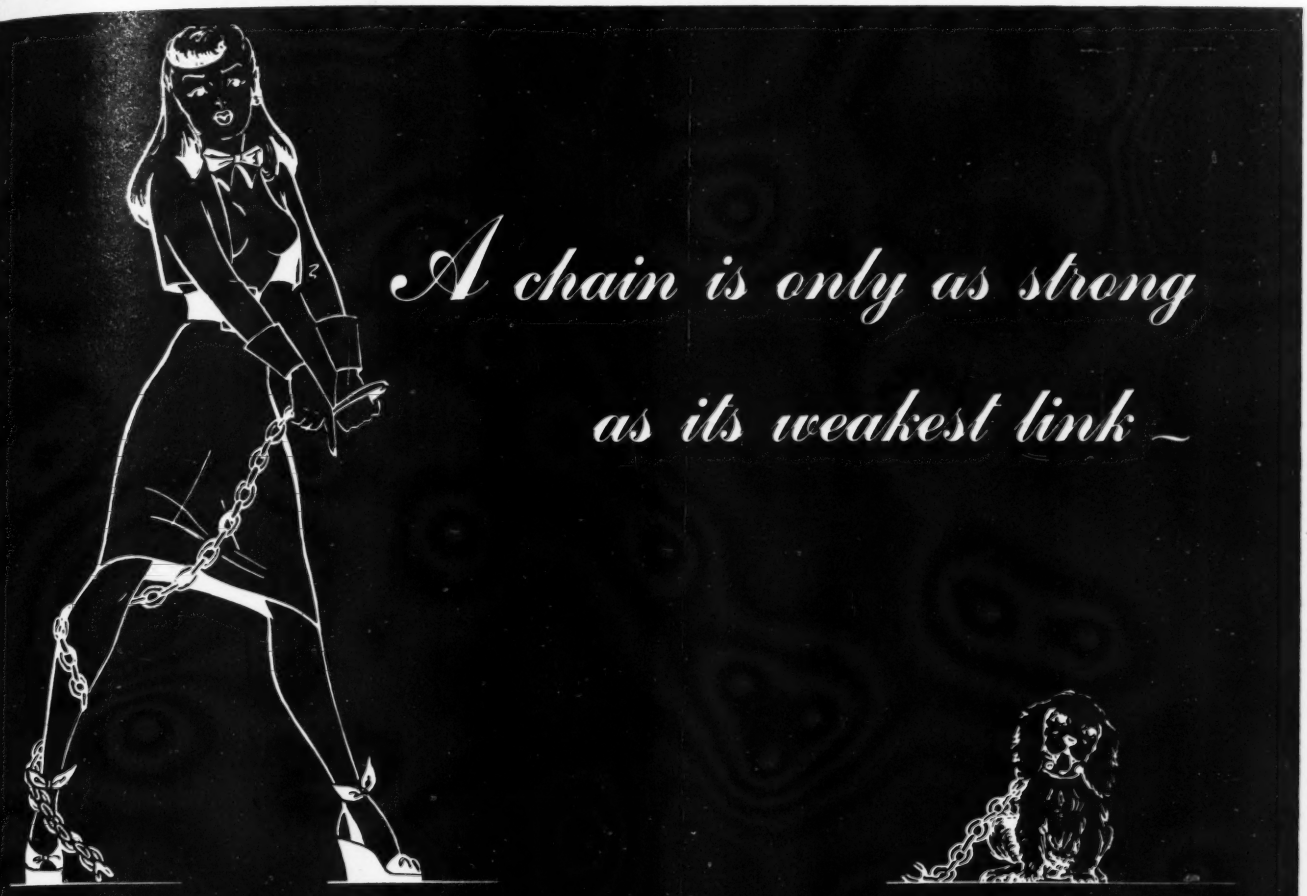

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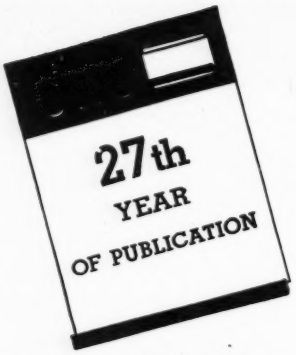

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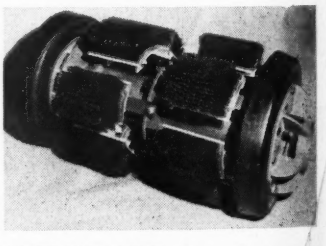

PIPELINE PIGS have been run through the Inch lines a total of 81,753 miles in a three-year period in Texas Eastern's continuous cleaning program, described on Pages 77-79.

Thermally Thinking

the editors

Anyone Want Quick Write-Offs?

Washington

DEFENSE PRODUCTION Administration spokesmen here say that the same special tax amortization provisions which have been snapped by some electrical utilities are available to gas companies. The quick write-off provisions of the Defense Production Act of 1950 cover any kind of industry designated as vital defense industries by the defense agencies concerned.

However, the gas utilities are not grabbing for these tax-amortization certificates as fast as some might think they normally would. There's a reason. Gas companies learned in other years that utilities commission and the Federal Power Commission reason that if the write-off for tax purposes takes place, then the companies must take the amounts off their books in figuring their rate-bases. This means lower rates for a long time to come, and perhaps that is why the gas companies are slow in jumping for the tax-amortization bait.

One company—Panhandle Eastern—has been nibbling at the tax-amortization bait, according to information here, but nothing definite has been announced yet. Perhaps other gas companies will want to come into the program and will try to make a case for inclusion, which they likely readily could do, in view of the fact that most of them serve very vital defense industries.

Requirements and Super-Requirements

THE ADJECTIVE "FEARLESS" as applied to the great majority of leaders in the many fields of endeavor is a cliche we usually delete from the bulk of the material that crosses the desk. Its constant repetition on public podiums has rendered it meaningless, and since we're trying in our small way to help restore some meaning to it simply by not using it, we'll refrain from applying it to F. O. Hess. But, offhand, we can't think of a better word.

GAMA's president has left his mark in his presidential year, and he hasn't done it by trying to be popular. His remarks before NEGA in March (see *GAS*, May, Page 39 *et seq*) enhanced his already established reputation as a dissenter. At AGA's research and utilization conference in Cleveland late in May he applied the clincher.

Appropriately, he was talking about research. Several aspects of gas industry research seemed to be getting under his skin. Expenditures, for one thing. A $9 billion industry with a $2 billion annual sales volume, it's spending but $240,000 (laboratories budget) plus $40,000 (pipeline research) plus total individual companies' programs and miscellaneous projects. All this totals up to far less than the $60-to-150 million needed to equal the 2 to 5% of annual sales volume which Mr. Hess says is the national average of progressive industries.

But Mr. Hess reserved his hottest fire for special utilities requirements. If the laboratory was conceived and created to prevent local, state, and federal regulation, and to advance the industry by establishing performance standards, and to give industry-wide aid to developments, he wanted to know whether we are accomplishing these aims if "every local utility and every city council or engineer can *and does* set up his own rules and regulations without consideration of the industry interest or the effect on the national economy."

On this subject, Mr. Hess might well have quoted one of the manufacturer representatives on the AGA gas laundry equipment committee. The committee was wondering why sales ratios of gas and electric clothes dryers were unfavorable. The principal difficulty, it developed, was simply that manufacturers were turning out many more electric dryers than gas.

Why? Well, there were several reasons, but chief among them was the fact that utilities have been superimposing their own requirements on those set up for the industry by the AGA Laboratories. These increase manufacturers' costs, hamper production. With materials in short supply an accelerated shifting to production of electric models is obviously in order.

Several members of the committee wondered whether a lot of gas companies don't feel that the AGA Seal of Approval is inadequate.

When you put it bluntly, just like that, it's a rather shocking question—coming, as it does, just a quarter of a century late.

Seven States in PAD's Hair

Washington

THE SO-CALLED seven-state committee on natural gas problems, which is headed by Harold Mason, chairman of the Ohio Public Utilities Commission, who was instrumental in calling it into being, is beginning to get in the hair of the Petroleum Administration for Defense, which now has the authority for rationing natural gas in critical defense areas.

However, the tack PAD officials are taking is to go along with the seven-state committee, which is composed mostly of officials of state regulatory bodies in Ohio, Maryland, Virginia, New York, Kentucky, Pennsylvania, West Virginia, and the District of Columbia, and to see if cooperation isn't the best course. But PAD officials resent the formation of the committee because it has "jumped the gun" by making public recommendations for action which the PAD probably would have undertaken anyway in the course of events.

When the seven-state committee met here, after Ohio's Public Utilities Commission called for such a gathering, PAD sent an "observer," who sat in the meetings. PAD officials say behind their hands that they still do not know why the meeting was necessary, unless it was to make the consumers in the various states feel that the state regulatory bodies are actively espousing local interests.

To understand this committee and its publicity activities, it's necessary to remember that in other years there always were occasions in the heavily industrialized Appalachian area to cut off industrial, commercial, or, at very rare times, domestic customers, due to lack of available natural gas during extreme cold snaps. Heretofore, Federal Power Commission has had the authority to give the companies the right legally to withdraw service as necessary.

Now, of course, PAD has the authority to allocate natural gas, instead of the FPC. PAD, of course, is thinking of defense industry—of which the seven-state Appalachian area has plenty. The agency planned to use its authority in about the same manner as FPC has used it in other years—by allowing the companies involved to determine for themselves which customers to cut off, if necessary, within adequate safeguards, of course.

Someone among the state regulatory agencies had the happy idea of forming a group to make recommendations to federal agencies. So the seven-state committee meeting was called in Washington and Mr. Mason elected chairman.

In its first release to the press, the seven-state committee, through Mr. Mason, set forth a six-point plan for several federal agencies and the Columbia Gas System Inc., and its subsidiaries, which serves more than a million customers in the area, to follow. A lot of the program makes sense to federal officials in the FPC and the PAD, but they still wonder why this new pressure should be applied on them for a specific program which, overall, already is being urged by many in the agencies involved and by other organized groups.

The program calls on PAD to give favorable consideration and action to allocation of necessary materials to permit completion of the Texas Eastern facilities already certified by the FPC, and like action to allocate materials for Appalachian utilities to expand underground storage facilities.

Completion of the Texas Eastern pipeline would bring an additional 100 MMcf of gas into Ohio, but that would represent only temporary relief, Mr. Mason said.

Other five points in the program outlined by the seven-state committee include:

1. A call to the FPC to take favorable action on the application of Texas Gas Transmission Corp. for installation of additional facilities. The commission also was urged to give favorable consideration to contracts underlying the application of Texas Gas and to deny efforts of intervenors who "will undoubtedly seek to divert some portions of the additional gas to be made available to the Appalachian area by these facilities."
2. Reassurance from Columbia Gas and its operating subsidiaries that natural gas service will not voluntarily be extended to any new markets during 1951. Assurance also from Columbia Gas that it will oppose any and all applications before the Federal Power Commission seeking extension of service to new markets.
3. An urgent appeal to the FPC for disapproval of all applications seeking extension of service to new markets to be served by Columbia subsidiaries, denying all such applications until the present situation has improved.
4. Denial by FPC of permission for exportation of natural gas by pipeline companies of the United States so long as there is need for this gas in the United States.
5. Exhausting of every means by both the state commissions and FPC to minimize, if not prohibit, the sale of natural gas for the off-peak or summer industrial loads where distributing utilities with underground or other storage facilities can show that such gas can be utilized in storage operations for the improvement of the natural gas supply for all classes of customers for preferred usages during ensuing winter periods. This effort, the committee said, should be directed primarily toward elimination of the use of natural gas as boiler fuel during the summer months.

By way of postscript, Columbia Gas' announcement in late June that it is taking certain steps to avert any shortages next winter may make further action by the committee on its fifth point unnecessary.

Columbia reportedly has worked out an arrangement with Transcontinental Gas Pipe Line Corp. whereby substantial volumes of gas would be purchased from the Texas-to-New York system through the summer for underground storage. From 55 to 200 MMcf per day would be purchased, as available, at 30 cents per thousand. This represents gas allocated to ConEd in New York and Public Service in New Jersey, but which would be used by both companies to underfire boilers as a substitute for coal or oil.

Columbia now has 97 billion feet in the ground, hopes to build this up to 160 by Oct. 1. Columbia is also buying gas on this basis from other pipeline systems.

Heselton Bill Will Expire

Washington

HEARINGS ARE SLATED soon, perhaps by early July, on the Heselton bill (H. R. 88) which would place gas pipelines under safety standards to be made up by the Federal Power Commission, but there is no good reason to believe that this legislation will become law in this session of Congress.

The attitude in industry generally, according to informed sources here, is to oppose the legislation on the grounds that it is useless. The industry, gas representatives say, has policed itself pretty well for many years and can continue to do so.

There are good reasons to believe that Rep. John Heselton (R.-Mass.), who introduced the legislation and has kept the appendix of the Congressional Record full of inserts about it in recent months, is not nearly so interested in putting the gas industry on the spot as to make it plain to the people of his district that he wants to "protect" them against all danger from the new pipelines being laid through his district. If he can fulfill his purpose of selling his constituents on the idea that he is on the job in a big way, and at the same time the gas industry can convince the House Committee on Interstate and Foreign Commerce that the federal control in this field is unnecessary, everybody will be happy.

Any bill on which hearings are being held this late in the session—and *only* in one House of Congress—is almost doomed to defeat unless it is of earth-shaking importance, and not even Heselton believes his legislation is of pressing and urgent national importance. He is the only Congressman who seems to be worried about gas pipeline safety, as of now, and there is no reason to believe that the others—immersed in bigger problems—are going to become intensely interested.

The American Gas Assn., with completion of the new 1951 Standard Code of Pressure Piping, likely could testify that it favors safety—who doesn't?—before the House committee hearings, but that perhaps some additions to the pressure code would be sufficient to satisfy all those who are fearful of widespread gas explosions. Industry spokesmen emphasize that they are primarily the ones concerned with safety and no one wants any hint to be broadcast that the industry views with lackadaisical attitude any talk about safety.

Basically, the safety standards in the pressure code relate to the steel used in the pipe, etc. What Heselton seems to want are assurances about the actual laying of the pipe. Industry spokesmen speak highly of Mr. Heselton, but many of them feel they can get through this session without his bill placing the industry as a whole under one more federal control facet. There has been some gentle disagreement within the industry, however. Some gasmen feel that placing the responsibility on FPC's shoulders might be a good thing (although FPC has said it cannot undertake the burden of policing pipeliners). Others take a different tack: They feel that a standard set of safety rules, applicable nationwide and administered by a federal body on a uniform basis, would be preferable to the varying state requirements on safety that must now be met.

Technical Trends

guy corfield

Non-Hydrocarbon Natural Gases

THE GREAT BULK of natural gas, produced and used as fuel, is composed principally of hydrocarbons which are predominantly methane, and usually also contains small percentages of other gases such as nitrogen or carbon dioxide which are merely diluents, or hydrogen sulfide or mercaptan sulfur compounds which are "impurities" and must be removed because of corrosiveness, odor, etc. In some instances and localities, however, natural gas of abnormally high diluent or impurity content is encountered. Sometimes this gas is of marginal value for fuel because of low heating value or expense of treatment; sometimes it cannot be used or purified economically; but sometimes it can be profitably utilized after treatment because of the resulting increase in Btu and the value of the by-products obtained from the treating process.

Nitrogen is a constituent that, while wholly inert from the corrosion standpoint, poses a problem when in concentration great enough to make the gas marginal in heating value, particularly when the gas must be transmitted great distances and the nitrogen imposes its proportionate share of the transmission expense. Nitrogen occurs in some gases up to as high as 30%, and reduces the gas to marginal value if present at about 15% or higher. The American Gas Assn., in cooperation with the U. S. Bureau of Mines, has instituted a research project to study practical nitrogen removal methods, but so far the results are not very promising. Nitrogen is chemically inert, and the approach therefore has to be through other expensive means such as low temperature liquefaction and distillation. One economic difficulty is that even if the nitrogen were removed and recovered in pure form it would have no significant commercial value.

Caron dioxide also occurs in natural gas in large percentages, and is generally similar to nitrogen as being principally a diluent. However, it is considered by some engineers to be corrosive as well when under high pressure conditions in the presence of liquid water; and furthermore, it is more expensive to transport than is nitrogen, having a higher specific gravity (compared to air as 1.0, carbon dioxide has a specific gravity of 1.5, nitrogen 1.0, and normal natural gas about 0.65). Carbon dioxide can be removed with relative ease, as far as chemical reactivity is concerned, and removal is economic and develops a useful by-product under some conditions. In the February 1949 issue of *GAS* a process is described wherein carbon dioxide, at an initial concentration of about 16%, is removed from natural gas and manufactured into dry ice.

Natural gas containing large quantities of hydrogen sulfide, in the amount of several percent or several thousand grains per 100 scf, commonly termed "sour gas," was until a few years ago considered commercially unusable except in carbon black plants. With the improvement of amine liquid purification processes, and metals to combat corrosion "in process," enormous volumes are now "sweetened" and thus made available for normal fuel utilization. Still more recently, due to a general industrial demand for sulfur, sour natural gas is becoming profitable as a source of sulfur which is recovered from the purification process. Thus the constituent of some natural gases, which formerly created the greatest problem, is now developing into a source of profit.

GAS Magazine of July 1945, under the title "Recovery of Free Sulfur from Natural Gas," describes the treatment of 4450 grain gas by the Girdler amine process. Currently sulfur is being produced from sour natural gas at an annual rate of at least 150,000 tons:

The latest and possibly the all-time high in hydrogen sulfide concentration is a new discovery, in a gas distillate field in northeast Texas, of natural gas containing *42% hydrogen sulfide* or, in gas industry terminology, approximately *26,000 grains per 100 scf*. This gas is of course extremely poisonous, and its handling will tax the skill and resourcefulnes of current engineering practice. However, if it appears to be a dependable supply of significant volume, its potential sulfur yield of 10-15 tons per MMcf will no doubt prove very attractive.

What Is A Good Abstract?

AN ABSTRACT is a most important part of a technical report, both to the reader, and to the writer who wants his report to be read. At one extreme an abstract could merely indicate the existence of the report, and at the other extreme it could be so lengthy as to practically repeat much of the report itself. The proper treatment is obviously somewhere in between.

It is interesting to see what the American Society for Testing Materials, after many years of producing and editing technical material, has to say on this subject, and we are therefore quoting from an article in the ASTM Bulletin of May 1951:

> Our abstracts should provide knowledge of the existence of a report; help the reader decide whether or not he should obtain and study the document; and, finally, serve as reference material. The abstract should not be too lengthy, but it should not be less than 100 words. The language used should be brief and concise, omitting all superfluous phrases and words. Brevity, however, should not impair intelligibility and ease of understanding. The abstract should always answer three questions: (1) What is the report or paper all about? (2) What is its scope? (3) What are the conclusions reached or results obtained? The abstracter should not attempt to analyze, evaluate, or criticize the report, but should present a clear and objective description of it.

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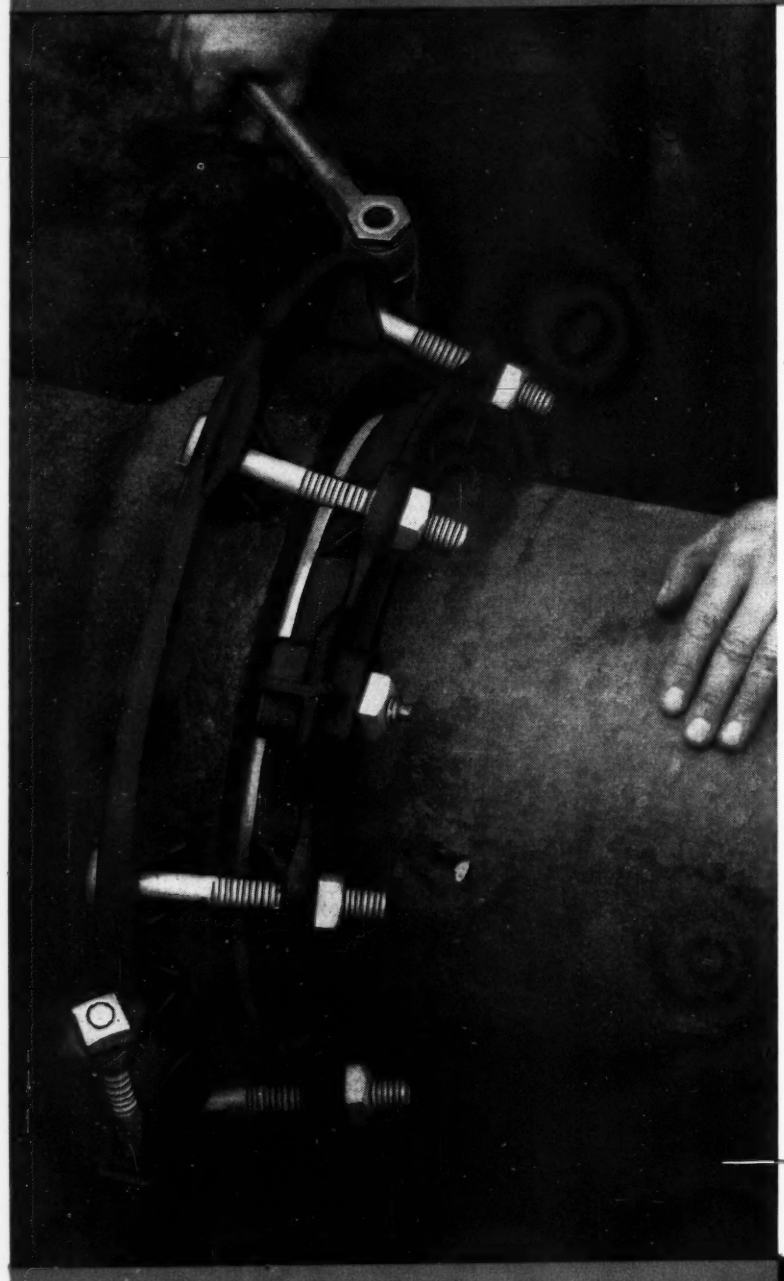

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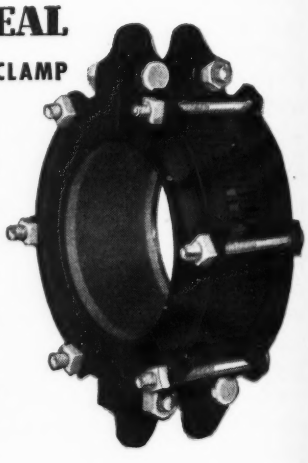

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Criteria for Selecting the Optimum Design For a Distribution Regulator Station

By H. M. McCAMISH

PART I

For want of established criteria, gas engineers have failed to reach general agreement on the subject of good regulator station design, in the opinion of the author. To fill that need he developed this paper for the Pacific Coast Gas Assn.'s distribution conference, held in Riverside, Calif. in April, setting up 10 fundamental requirements which, if observed, would upgrade design practices from "adequate" to "optimum."

The first nine are discussed in this installment. The tenth, "Minimum Cost," will be presented next month in Part II, together with illustrations of the application of all 10 to the evaluation of specific designs and a presentation of the use of pressure profiles for comparing piping arrangements used in station fabrication.

Mr. McCamish is assistant engineer for Coast Counties Gas & Electric Co. at Concord, Calif.

THE one most striking thing about distribution regulator station design within the gas industry is probably the general lack of agreement as to what does and what does not constitute good design. Even within the same company, one will often find that the same regulation problem is handled several different ways at different stations. This does not appear to be due to any well defined progress in design but rather largely to a lack of sufficient engineering to properly evaluate the merits of various designs.

I believe that this situation exists because of the fact that in about 90% of the cases it is a relatively simple task to design a regulator installation which will adequately handle the regulation requirements, while the disadvantages of a given design are largely intangibles which are somewhat difficult to evaluate. In other words, it is often the case that the first layout conceived is used (and works satisfactorily) without the obvious question being asked, "Is this the best design for the situation?" The question of "best design," of course, involves such factors as best operation, safest, least expensive, etc.

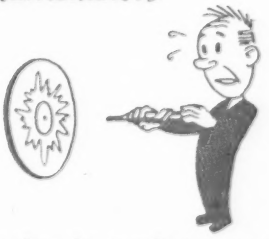
As it appears that some criterion is needed in order to determine the best design for a given regulation problem, the following list of fundamental requirements for good regulator station design has been compiled:

1. Pressure regulation meets requirements.
2. Provisions for continuing proper operation.
3. Service continuity provided for.
4. Protected from traffic damage.
5. Minimum hazard to public.
6. Minimum hazard to personnel.
7. Maintenance and operating needs provided for.
8. Minimum space occupied.
9. Outward appearance unobtrusive.
10. Minimum cost.

The problem of good regulator station design is the problem of selecting the proper equipment and arranging this equipment so as to satisfy these ten requirements to the optimum. As there can be no absolute right or wrong in design, the problem resolves to one of intelligently balancing the requirements, using sound judgment as to the relative importance of each requirement in the particular problem at hand.

The following is an elaboration upon each of the ten requirements.

1. PRESSURE REGULATION MEETS REQUIREMENTS



It is obvious that the regulation must handle the minimum and maximum loads within required pressure limits or else the station might as well not be built in the first place. Without going into the matter of the great number of commercially available models of regulators or the multiple of "fine points" in the science of pressure regulation, the decision to be made reduces largely to a choice of the method of loading the regulator diaphragm. The following methods are used:

1. Weight loading.
2. Spring loading.
3. Pilot loading.
4. Instrument loading.

The accuracy of regulation obtainable with each of the loading methods increases from top to bottom as listed above.

The present trend is toward the use of weight loading on lower pressures only. Weight loading has the advantage of constant loading throughout the valve range as compared to spring loading. It has the disadvantage as compared to pilot loading of requiring heavier diaphragm material because of the necessity of withstanding the pressure differential between outlet pressure and atmospheric pressure. This disadvantage becomes more crucial at high pressures, of course.

Because of size and weight considerations "lever" weight loading is utilized for high pressures, the space requirements being consequently increased. With both "outside" dead weight loading and "lever" weight loading, the disadvantage of being easily tampered with is an additional factor.

Since for small loads pilot loading is more expensive than spring loading, it should be used only if spring loading cannot provide adequate regulation. For this reason, spring loading is used almost exclusively for small district regulator stations. The advent of the smaller pilot loaded regulator (viz. Emco 1001) has broadened the range of economical application for pilot loaded regulators and has consequently increased the use of pilot loading in district regulator stations. For large loads, the pilot loaded regulator compares favorably cost-wise with the spring loaded regulator and usually requires less space as well as providing better regulation. Pilot loading provides the additional advantage of selection of control point. The instrument controller provides the highest degree of pressure regulation but because of the higher cost and greater space requirements, it is used mainly on very large installations and for cases of difficult regulation.

For special regulation problems, the consideration of valve shape may be important. Where accurate regulation

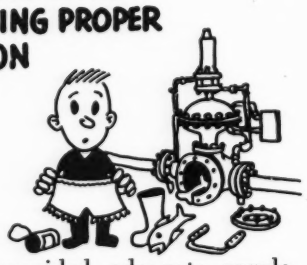
is required on an operation which involves a minimum load which is a small percentage of the maximum load, V-port, or parabolic valves may be used to an advantage. It is to be noted, though, that the regulator capacity is reduced one-third by the use of these types of valves. Another method of handling this problem is to employ dual regulators and set one regulator to open at a slightly lower pressure than the other, thus taking one regulator out of service at low loads. In order to be able to use this method, it is necessary that there be an allowable pressure variation of at least ½ lb. Extreme variations in load requirements may be handled by combining two regulators, one of which has a much greater capacity than the other, and setting them at different pressures as explained above. I believe that this method of handling the problem, though used extensively, is not being utilized to the extent that it could be.

In addition to the regulator itself, the piping arrangement enters into the problem of maintaining the pressure within the required limits. Where the regulator capacity is not critical, the upstream pressure drops are generally not a major consideration. The downstream pressure drops must not, however, exceed the allowable pressure variation at maximum load. When pilot or instrument loading is used, downstream pressure drops may be overcome by locating the control point beyond the station piping. It must be remembered, in this case, that the capacity of the regulator depends upon the pressure drop across the regulator which then does not correspond to the difference between the upstream pressure and the controlled pressure.

Proper lockup is a further consideration connected with pressure regulation. Although this is not a critical matter in district regulator stations, it can be a serious problem in customer stations where operations involve complete shutdowns. This is largely a question of proper selection of valve seat material; composition seats are highly favored in the industry as a whole. It is more difficult to maintain 100% lockup with the double seated or balanced valve type of regulator than with the single seated type.

Provision should be made either in the regulator (or in the space provided in the piping for the regulator) for future growth requirements. No one would design a station which would have to be replaced in one year because of capacity limitations. Allowance for expansion requires judgment as to the rate of future growth, the permanence of the station location, probable obsolescence of the equipment, etc.

2· PROVISIONS FOR CONTINUING PROPER OPERATION



Having provided adequate regulation, the next problem is to assure that the regulation will remain adequate. Anything which will cause the regulator to fail open or closed or even slow its response in either direction, will, of course, reduce the accuracy of regulation.

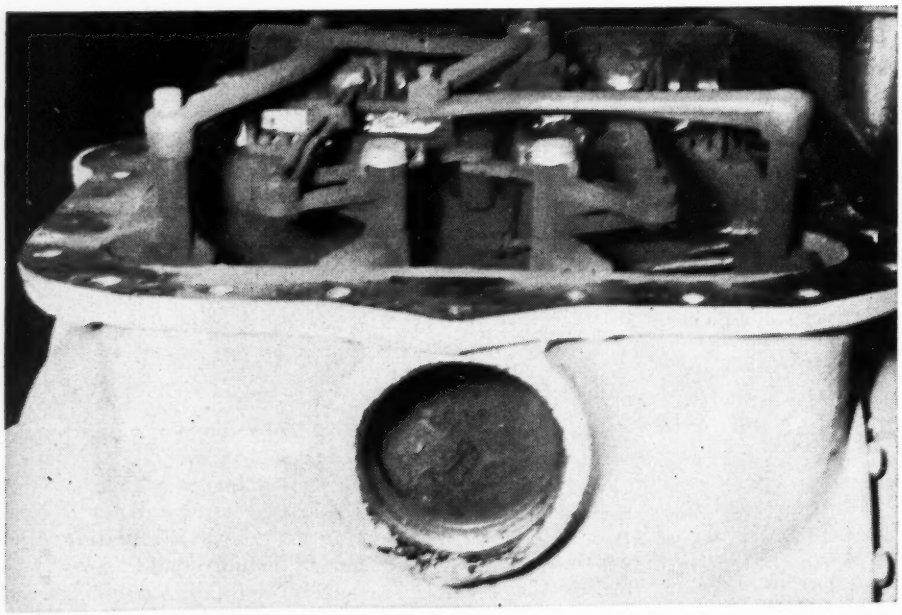


Fig. 1. Large ironcase displacement meter removed from service after 20 months. Note dust in outlet despite filters upstream.

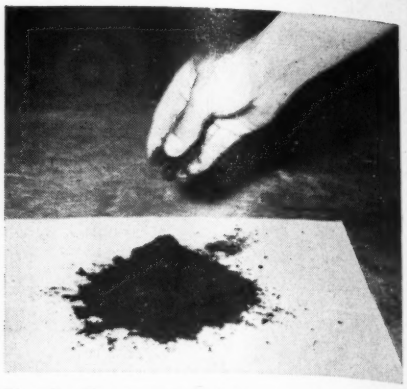


Fig. 2. Dust removed from valve chamber of meter shown in Fig. 1.

Probably the most common trouble along this line is that resulting from "dirt" in the gas line. This dirt may be anything from a fine iron oxide powder resulting from rusting of the pipe to a dead cat inadvertently included during construction. Whatever form it may take, it is a problem. The finer types of dirt have a highly erosive action upon the parts of the regulator exposed to the gas stream (valves, valve seats, toggle arms, etc.), while larger particles tend to jam the regulator in a fixed position. When pilot loading is utilized, the fine dust problem becomes extremely acute, as only a minute amount of dust is required to clog the small pilot orifices or to prevent the valve from closing.

I realize that anyone who has been connected with the operation of gas facilities for a period of one month or more, probably is aware of the dust problem and knows that the problem is handled by either scrubbing or filtering the gas. My purpose in going into this, however, is to point out that there is one phase of the dirt removal problem which has not, to my knowledge, been adequately solved by any commercially available equipment. None of the myriads of commercial models of scrubbers or filters with which I am familiar has provided the real answer to the removal of fine pipeline dust at medium or large capacity, underground district regulator stations or at medium sized customer installations. The scrubbers are always too large and expensive, and the filters do not provide the required capacity. Faced with this situation, several of the larger gas companies on the west coast have designed and produced large capacity filters of their own. However, even these filters are comparatively bulky for their capacity. For the smaller company which does not wish to go into the manufacturing business, the problem still remains unanswered.

Figs. 1 and *2* illustrate that this fine pipeline dust is a problem which cannot be ignored. The meter shown torn down in *Fig. 1* was removed from service only 20 months after installation

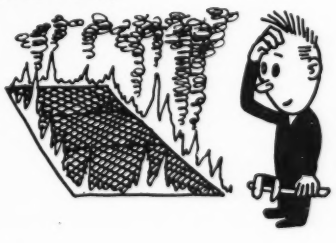
because of the considerable accumulation of dust throughout the meter. The pile of dust shown in *Fig.* 2 was removed only from the valve chamber. Dust trouble had been experienced at this installation previous to the installation of this meter and consequently, as a test, a 4-in. dry cyclone type filter and a 2-in. commercial felt filter were installed in series upstream of the meter.

The intermittent load reaches a maximum of 60 Mcf an hour which is approximately 200% of the rated capacity of the felt filter and slightly less than 100% of the calculated capacity of the cyclone filter. As indicated by *Figs. 1* and *2*, the test showed that the felt filter will not remove fine dust when used considerably above rated capacity and the cyclone filter will not remove dust at all. As a matter of fact, the cyclone filter came out considerably cleaner than when it went in.

The removal of liquid slugs and mists is generally less of a problem than that of dust removal. The cyclone principle lends itself admirably to the removal of liquids and consequently there are many fine commercial models of mist extractors or liquid separators available. The major considerations in selecting a mist extractor are cost, comparative size for capacity, and ease of installation in the piping system.

In pilot loaded installations, control line freeze-up is sometimes a problem. Although electrical systems are available for heating piping installations, the method commonly used in the industry is the small gas heater with a small hot water heat exchanger unit. This method provides simplicity of installation, dependability, and low operating costs and has the further advantage of not requiring a source of electrical energy.

3· SERVICE CONTINUITY PROVIDED FOR



Some thought must be given in the preliminary stages of design to the service continuity requirements of the regulator station. Is it necessary that a gas feed be available at all times through the station or can the station be completely shut down? Can it be shut down for a long period or for a short period of time? The answers to these questions determine whether there should be single regulation or dual regulation and largely determine the extent of bypassing to be installed.

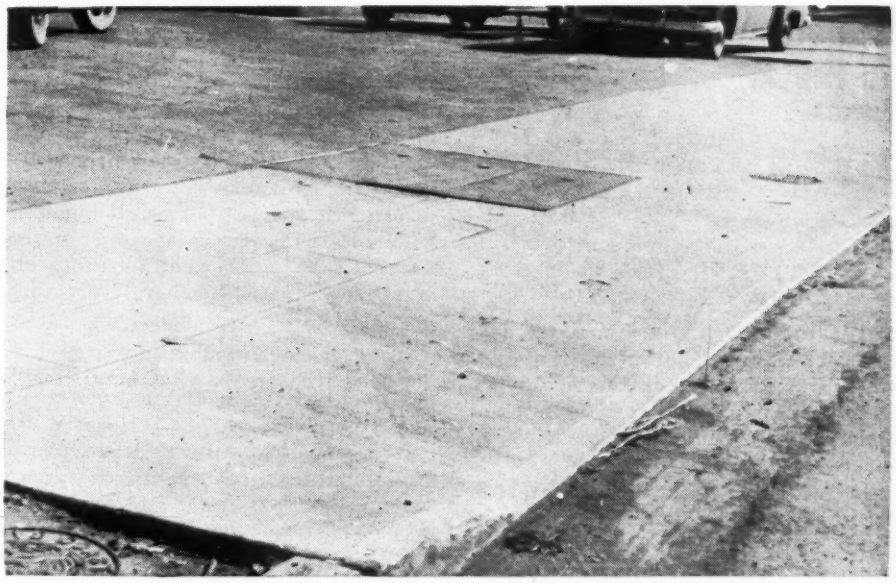


Fig. 3. Quarter-inch diamond plate over pit with 100% opening.

We have adopted a policy which requires that for any distribution system of 25 or more customers there shall be at least two regulators serving the system. Where there is only one feed to a given distribution system of more than 25 customers, dual regulators are used in the station. In these dual regulator stations one of the regulators will not necessarily handle the winter maximum hourly load, but at least the chances are good that if one of the regulators does fail, it will not occur at the time of this maximum load. The cost of providing dual regulation is not excessive as two smaller regulators replace one larger one. In large customer meter stations dual regulators often may be used to advantage to provide better regulation at varying loads (as explained under Requirement 1). I feel that dual regulation does not eliminate the need for bypassing equipment.

A bypass line is usually installed around the regulators for use during maintenance work or in the event of a regulator failure or some other emergency situation. There is a definite divergence of opinion as to whether separate bypassing should be provided for the filter when one is required in the station. No set rule may be applied to this as the decision should be dependent upon the difficulty involved in providing controlled pressure by bypass valve throttling at the particular station. If a small system were being supplied with 3 lbs of pressure off a 150-lb supply line, it would probably be difficult to maintain any great degree of control by hand throttling, and a separate bypass for filter maintenance would probably be justified. In many cases a separate bypass is not justified.

Another aspect of bypassing arrangement will be discussed under Requirement 6.

4· PROTECTED FROM TRAFFIC DAMAGE

Because of the rapid growth on the west coast it has been somewhat of a problem to keep up with this requirement. Aboveground stations located in sparsely settled areas a few years ago may now be next to a busy intersection or alongside a highspeed freeway. The most satisfactory answer to this problem, when practical, is to go underground. This not only protects the facilities from traffic damage but may solve another problem, that of appearance. (See Requirement 9).

With underground stations, consideration must be given to the strength of the pit cover. It is probably good insurance to design covers to at least support a passenger car and to design those covers which may be subject to vehicular traffic for the maximum weight vehicle probable. It would appear to me that the practice of designing pit covers for parkway or sidewalk locations so as to support only pedestrian traffic is questionable if there is *any* possibility of the covers being subjected to vehicular traffic.

Where it is not practical to put the facilities underground, protection may be achieved by using sturdy barriers (and they can't be too sturdy) or by purchasing sufficient land to provide a "buffer zone" between the traffic and the station.

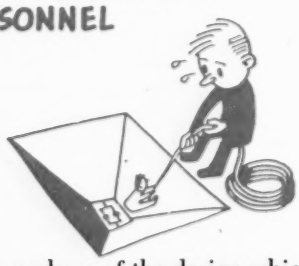
5·MINIMUM HAZARD TO PUBLIC

The designer and the man in the field in charge of installation have a joint responsibility to install a regulator station which is as safe from the public's standpoint as human ingenuity can make it.

Because of the ever-lurking threat of escaping gas, the station should be as far as practical from other structures. Where pits are subject to pedestrian or vehicular traffic, they should have flush covers which stay flush.

All regulator stations should be adequately secured from malicious mischief. The problem of securing a pit which must have a flush cover is an interesting one which has been nicely solved either by the use of "key wrenches" or by use of removable hand holes for access to company locks.

6·MINIMUM HAZARD TO PERSONNEL



This is one phase of the design which is often neglected. Probably the single consideration which can most effectively decrease hazard to personnel is the use of minimum depth pits. A pit from which the men can easily hoist themselves on any side is infinitely safer than one in which they must first get to the ladder and then climb several feet in order to get out. Closely connected with this is the percentage opening of the pit. The "tunnel" entrance to a pit is indeed dramatic but hardly provides for rapid exit in an emergency. Many companies are installing pits with a percentage opening of 100 wherever practical and I believe it is practical in many more cases than is realized at the present time. *Fig. 3* illustrates a pit with a diamond plate cover which is subject to continual passenger car loads and occasional heavy truck loads. This pit has a 100% opening and certainly satisfies Requirements 5 and 9.

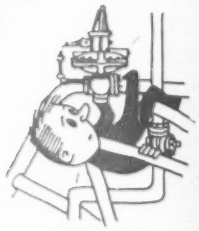
In pits where it is necessary to exceed a depth of 5 ft, the ladder should be so arranged as to be readily accessible to the working area of the pit. In a large pit with a percentage opening which permits it, the use of two ladders at opposite ends of the pit should be considered.

There is also a potential hazard in the arrangement of bypassing facilities which is worthy of consideration. From the safety standpoint, it would be desirable to have complete bypassing facilities outside of the pit. This would require an inlet, an outlet, and a bypass valve outside of the pit, and would provide for shutoff of the regulator station in case of a fire in the pit. It appears doubtful, though, that the frequency of fires in regulator pits would justify this added expense. *Fig. 4* shows the layout of a pit wherein all valving is outside of the pit. The only items within the pit are two 3-in. balanced valve regulators. In this case, no additional valving was required but it is doubtful if the added inconvenience (because of lack of bypassing facilities within the pit) is compensated for by the increased safety factor.

The weight of a single piece of the cover should not exceed 100 lbs and an entrance should be provided which does not require lifting more than 50 lbs so that one man by himself can easily enter the pit. Handles should be provided for ease of lifting and, to fulfill Requirement 5, they should be flush when not in use if the pit is subject to traffic.

Any relief valving or blow-offs should have stacks of sufficient height to assure safe dissipation of the gas from the work area.

7. MAINTENANCE AND OPERATING NEEDS PROVIDED FOR



This requirement involves one of the intangible costs of poor design which over a period of years can conceivably amount to an expense of appreciable magnitude.

When determining the size of the regulator station whether aboveground or in a pit, the space requirements for efficient operation and maintenance should be considered. In addition to the size of the station, the arrangement of the facilities within the station affects the adequacy of the working space. The working and lubricating of valves, the removal of flanges for filter cleanout, the breaking of flanges or other type connections for replacement of regulators, and many other functions require certain wrench clearances, working room for personnel, etc. I believe that the use of socket sets in connection with hex head bolts and hex nuts is justified by the then possible saving in pit size and the increased safety realized.

Those elements which are frequently worked upon (such as regulator adjustment screws, regulator repair points, pressure test taps, etc.) should be readily accessible.

In the case of pits, the question of percentage opening arises again as this factor affects the ease of working on the facilities to a considerable degree. It is easy to see how the changing of a large balanced valve regulator would be much easier (and consequently faster) in a pit with 100% opening as compared to a pit with a "tunnel" entrance.

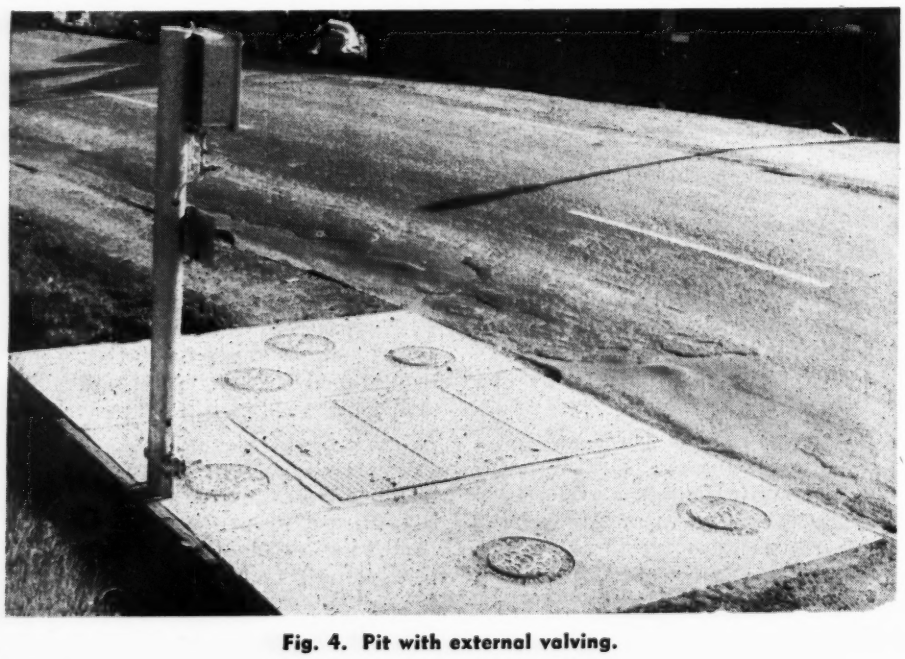
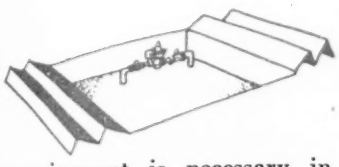


Fig. 4. Pit with external valving.

8. MINIMUM SPACE OCCUPIED



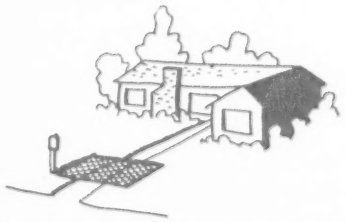
This requirement is necessary in order to make possible the fulfillment of several other requirements. As the size of the regulator station increases, it becomes more difficult to:

1. Protect from vehicular collision if aboveground (Req. 4).
2. Provide with cover of sufficient strength if underground (Req. 4).
3. Isolate from other structures (Req. 5).
4. Secure from malicious mischief (Req. 5).
5. Provide minimum weight covers (Req. 6).
6. Provide unobtrusive location (Req. 9).
7. Maintain economical construction (Req. 10).

It should be emphasized that this requirement does not negate the previous requirements (i. e. working space, accessibility of equipment, etc.) but is intended to emphasize the fact that the space occupied should not exceed the space necessary.

It should also be pointed out that the space allowed must be consistent with future expansion. (See section on growth under Requirement 1.)

9. OUTWARD APPEARANCE UNOBTRUSIVE



This is a final refinement of design but failure to consider it when laying out a regulator station can cause more difficulty than many of the other factors already discussed. The primary difficulty lies in the fact that very few of the citizenry consider a regulator station attractive. As this is a public relations matter, much of the decision as to what is required must be left to the person in the field who has contact with the persons most involved.

Generally, the following steps will help forestall public relations difficulties before they arise:

1. Locate as inconspicuously as possible.
2. Consider noise problem in design.
3. Plant shrubs or vines for screening if aboveground.
4. Paint facilities neatly.
5. Employ weed control if aboveground.
6. Cover neatly if in pit.
7. Locate vent as inconspicuously as possible if in pit.

(To be continued)

An Operating Kink

Clamp for Welding Pipe

When working with pipe, it is frequently desirable to have some form of clamp for holding sections of pipe. Many types of clamp can be made. Some are clamped over the pipe end; others require temporary welds. Here is a clamp which is inexpensive, easy to make, and easy to attach.

The clamp shown in *Fig. 1* consists essentially of two parts, the collar which clamps to the pipe wall, and the supporting rod which carries the load when the pipe is being hoisted. Both parts are easy to make and assemble. Here's how to do it:

The collar is formed from a section of steel bar. Dimensions for this bar are given in *Figs. 2* and *3*. After cutting the bar to proper length (L), place it over a section of pipe on which the clamp will be used. By alternately heating with the blowpipe and pounding with a hammer, shape the bar to the contour of the pipe.

After the bar has been properly shaped, bend the ears by placing the ends of the bar in a vise. (E) in *Figs. 2* and *3* shows the amount the ear should extend after bending. Dimensions for the bolt holes are shown in column (F). These holes may be pierced with the cutting blowpipe or drilled. Place the holes as close as possible to the bends in the collar, allowing enough space for the head of the bolt and the nut. This assures maximum gripping pressure over the greatest area of pipe without bending the ears.

The diameter of the supporting rod is determined by the size of the pipe being handled. Bend the rod to the shape shown in *Fig. 1* and weld the ends to the collar.

This kink is presented through the courtesy of *Linde Tips,* publication of Linde Air Products, New York.

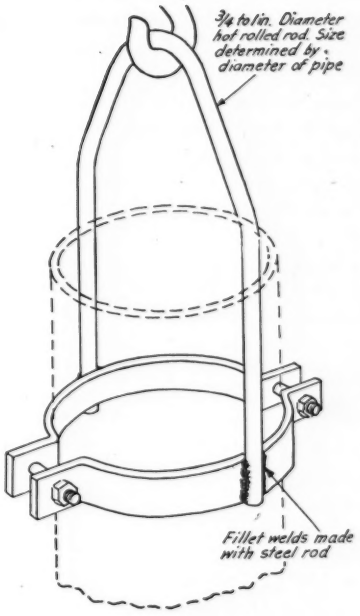


Fig. 1. (TOP) This clamp may be made from scrap material and is satisfactory for most pipe-handling applications.

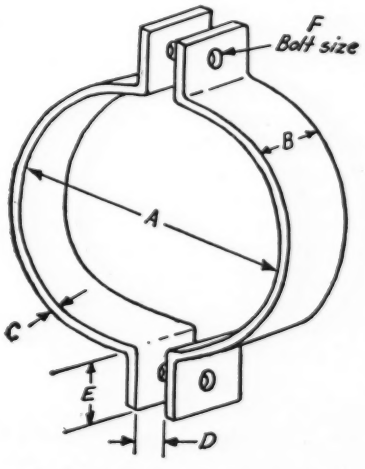


Fig. 2. (RIGHT) Diagram of clamp labeling various dimensions.

Fig. 3. (BELOW) Table of dimensions for constructing clamp.

Size of Pipe	Diameter "A"	Length of Bar "L"	Width of Bar "C"	Thickness of Bar "B"	Space between Ears "D"	Length of Ear "E"	Bolt Size "F"
3"	3.50"	9"	1½"	¼"	½"	2"	⅜"
4"	4.50"	10⅜"	1½"	¼"	½"	2"	⅜"
5"	5.63"	12"	2"	¼"	½"	2"	½"
6"	6.625"	14"	2"	⅜"	¾"	2"	½"
8"	8.625"	17¾"	2½"	⅜"	¾"	2½"	½"
10"	11.750"	22½"	2½"	⅜"	1"	2½"	½"

Reviewing the East Ohio case

Double Jurisdiction Is Costli
And Its Customers More Th

RECENT activities in jurisdictional matters on the part of the Federal Power Commission, as well as bills currently under Congressional consideration, have once more turned the attention of the gas industry to the famous East Ohio case as the precedent for further federal encroachment upon state regulation of public utilities. The decision of the Supreme Court[1] cleared the way.

Exclusive

Now we wonder: What effect has this decision had upon the company's operations and upon the welfare of its customers? Let's look first at the facts, then at the decision, finally at its impact.

The operations of East Ohio Gas Co. are all within the state of Ohio. It receives its supply of natural gas *in Ohio* from pipelines that bring the gas in from other states. Upon receiving the gas, East Ohio then transports it through its own lines to various communities *in Ohio* where retail distribution is made. The gas is taken from the interstate pipelines without any reduction in pressure until it reaches the various localities where distributed. Not one particle of the gas crosses the state line after it enters the system of East Ohio.

The Federal Power Commission asserted jurisdiction over the accounting practices of East Ohio upon the ground that it was transporting gas in interstate commerce and, therefore, was a "natural gas company" within the meaning of the Natural Gas Act. The company contended it was engaged solely in local distribution, and thus, came within the language of the act which says it ". . . shall not apply to any other transportation or sale of natural gas or to the local distribution of natural gas or to the facilities used for such distribution . . ."

The United States Court of Appeals for the District of Columbia Circuit upheld the company's contention by a 2 to 1 decision.[2] The FPC then took the case on up to the Supreme Court.

The Supreme Court rejected the contention of the company and sustained the Federal Power Commission by a 5 to 2 decision. Two of the Justices did not participate in the case. The majority decision turned solely on the fact that there was no reduction in the pressure at the time the gas entered the lines of East Ohio, stating, "but what Congress must have meant by 'facilities for local distribution' was equipment for distributing gas among customers within a particular local community, not the high-pressure pipelines transporting the gas to the local mains." This puts the dividing line between federal jurisdiction and state jurisdiction somewhere between the point at which a local distribution company receives gas from an interstate pipeline and the burner tip of the consumer. The exact point is left in doubt depending apparently upon some matter of engineering involved in the mechanics of the industry.

Throughout the case, from its inception before the Federal Power Commission, the state of Ohio and the Ohio Public Utilities Commission were parties intervenor. In the Supreme Court, the National Assn. of Railroad and Utilities Commissioners along with the public service commissions of Indiana, Michigan, Wisconsin, and New York, and the public utilities commission of California filed briefs, *amicus curiae*, supporting the contention of East Ohio. When the decision was handed down and its holding made known to the various states, the regulatory commissions of substantially all the states rose up, almost as one body, and joined in a motion for rehearing, vigorously protesting the decision because of its effect upon regulation by the states. This protest availed nothing and a rehearing was denied.

Justice Jackson wrote a clear and vigorous dissent in which he was joined by Justice Frankfurter. The dissenting opinion points out that the purpose of the Natural Gas Act was to "supplement but not to supplant state regulation."

The reason for passage of the Natural Gas Act in 1938 was that a gap existed in the regulation of the natural gas industry that the states could not fill. The state regulatory commissions could fix the retail rates at which gas was sold to the local consumers but could not reach beyond the borders of the state to investigate and fix the wholesale rates charged by the pipelines that brought the gas in from another state and sold it to the local distribution company. This situation resulted from decisions by the Supreme Court based upon sound constitutional grounds.[3] The fixing of these wholesale rates for interstate pipelines was a legitimate field for federal regulation in order for regulation to be complete. The existing gap needed to be filled and this was all that the Natural Gas Act was designed to do.

What States Thought

When the act was pending before Congress, it was supported by the regulatory commissions of the various states because they well knew the need for bridging the existing regulatory gap and they were led to believe that the exemption of local distribution reserved to the states their full jurisdiction over the local companies operating wholly within the borders of their respective states. The opinion of Justice Jackson reviews the legislative history

Ten years experience in state regulatory work with the Missouri Public Service Commission fitted John P. Randolph for his present position as general solicitor for the National Assn. of Railroad & Utilities Commissioners, an organization composed of utilities regulatory men from each state and dedicated, among other aims, to the preservation of states' rights in this field.

Elected at the NARUC annual convention in Phoenix, Ariz. last November, Mr. Randolph assumed office Jan. 1. For the last two of the 10 years he was with the Missouri commission, Mr. Randolph was a commissioner; previously he held the position of general counsel.

Senate bill S. 1084, to which the author refers, and its companion bill in the House, HR. 3941, may soon come up for hearing, according to the author. The FPC has issued to both houses of Congress its recommendations and comments on the bills, and they have proved to be less unfavorable than expected. This fact has inspired some restrained optimism on the part of state regulatory authorities.

[1] *FPC v. East Ohio Gas Co., et al.*, 338 U.S. 464; 94 L ed 268.

[2] *FPC v. East Ohio Gas Co., et al.*, 84 App DC 312, 173 F2d 429, 74 PUR NS 256.

[3] *Missouri Ex Rel Barrett vs. Kansas Natural Gas Co.*, 265 U.S. 298, 68 L ed 1027.

Costility

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By JOHN P. RANDOLPH

National Assn. of Railroad & Utilities Commissioners

The ever-lengthening flow of FPC jurisdictional assumption along the gas stream, upstream toward the wellhead and downstream to the city gate, is once more strongly evident in the news. Within recent weeks the commission has on the one hand delved into the natural gas operations of a major producer, Phillips Petroleum Co., and on the other issued an order bearing directly upon the status of intrastate transmission and distributing companies.

At press time the Phillips case, for which hearings were concluded some time ago, had not been brought along to the point of decision making. But in the Indiana Gas & Water Co. case an initial decision was still standing, finding the Indianapolis firm subject to federal jurisdiction and whatever unnecessary expense and red tape might be ordered.

Indiana's case started in August 1949, when with two other companies it filed a petition for a declaratory order, which included a request that the proposed acquisition and operation of certain facilities by Indiana Gas be declared exempt from the Natural Gas Act.

Two months later FPC instituted a proceeding to determine whether Indiana Gas was subject to FPC jurisdiction. Then, a year ago this month, Indiana Gas filed an application seeking either a disclaimer or authorization to acquire three Indiana gas companies—Eastern Indiana Gas Co., Summit Gas & Water Co. Inc., and Knightstown Natural Gas Co. This application was subsequently consolidated for hearing with the jurisdictional proceeding.

Last October FPC granted temporary permission for the acquisition and operation, and the examiner's decision was to grant the final authorization.

So Examiner Samuel W. Jensch in May came up with his decision: Indiana Gas & Water is a "natural gas company" within the meaning of the Natural Gas Act, since, while all its physical facilities are located within the state, it has 14 connections with four interstate pipelines subject to FPC jurisdiction. Furthermore, "the gas continues the interstate flow after the delivery, as the flow is not altered, changed, or stopped by the regulators through which it travels."

With these "initial considerations" determined, said the examiner, the issue then is whether the operations of Indiana Gas constitute only local distribution and whether its facilities constitute only local facilities within the meaning of the act.

The Jensch conclusion: All of the pipeline facilities designated in the jurisdictional proceedings "are used for the transportation of natural gas in interstate commerce as contemplated by the Natural Gas Act, up to the point of the town border or regulator stations which are utilized to reduce pressure to the intermediate or distribution systems served therefrom. In some instances, the pipelines with higher pressures extend through municipalities, but from those lines town border or regulator stations reduce pressure for the adjacent distribution systems; and thus, in those instances, the interstate transportation continues through the municipalities in the high-pressure pipelines. Further, it is concluded that such high-pressure pipelines are not facilities used in local distribution, nor is the tap line service from such pipelines a 'local distribution' as contemplated by the act."

of the act and points out the various parts of the language of the act itself, as well as the legislative history, that led the states to believe that their jurisdiction was being preserved and that there would be no encroachment upon this jurisdiction by the Federal Power Commission. Justice Jackson's opinion also observes that the majority opinion has now approved the very encroachment that the states feared and thought had been avoided and concludes with this significant statement:

> I think that observance of good faith with the states requires that we interpret this act as it was represented at the time they urged its enactment, as its terms read, and as we have, until today, declared it, viz: to supplement but not supplant state regulation. What amounts to an entrapment of state agencies that supported this act under the representation that it would not deprive them of powers but would only make their powers effective will probably not make it easier to get needed regulatory legislation in the future.

An appropriate question at this point would be: "Well, who is hurt and how?"

Who's Hurt

In the final analysis, the people who are hurt are the consumers. They are hurt in their pocketbook. East Ohio itself gives the best illustration.

Before the FPC moved in on East Ohio, it was fully regulated by the Ohio Public Utilities Commission and had been so regulated for many years. The company was keeping its books according to a system of accounts prescribed by the Ohio commission under the Ohio law. When the FPC arrived on the scene it said in substance: "Here, now, you are a natural gas company within the provisions of the Natural Gas Act and subject to our jurisdiction. Hereafter you will keep your books as we say. We want an original cost study made, an original cost inventory of all your properties. When that study has been completed, and approved by us, then you will record your plant on your books at these original cost figures and keep your accounts thus hereafter."

This all started in April 1946. Prior to that time, however, the FPC issued a number of general orders that were served on East Ohio and required it to prepare and file various forms and reports of financial and statistical matters. In fact, the first order of this kind was issued just two weeks after the Natural Gas Act was passed. The FPC wasted little or no time in going to work on East Ohio along with a number of other companies with similar operations in other states, despite the fact that Dozier A. DeVane, then general counsel for FPC, appeared before a subcommittee of the House Interstate and Foreign Commerce committee while the Natural Gas Act was in the process of being enacted and made the following statement:

> The whole purpose of this bill is to bring under federal regulation the pipelines and to leave to the state commissions control of distributing companies and over their rates, whether that gas moves in interstate commerce or not.

About the same time Senator Wheeler, then chairman of the Senate Interstate and Foreign Commerce committee, said to his committee concerning the act: "The states retain all the state power they have at the present time. Let me say, as a matter of fact, the bill does not interfere with the state regulation in any way, shape or form." Regardless of all these assurances to the states, the FPC moved in and now we are confronted with the decision of the Supreme Court giving the full green light to the efforts of FPC to at least duplicate in part, if not supplant, state regulation.

Now we come to the point where we find the effect upon the customers' pocketbook. As of Jan. 31, 1951, East Ohio had spent $1,342,000 in its effort to comply with the FPC orders. The job is not yet finished and the company officials at that time estimated that an additional $1 million would be required for completion of the work. During the hearing when the case was first before the FPC, the company estimated that the expense of compliance would be between $1.5 million and $2 million. FPC

said the estimate was "not convincing, for our experiences with other companies with greater property investment indicates that this estimate is considerably exaggerated." This statement by FPC is referred to in a footnote to the majority opinion of the Supreme Court. The present facts indicate that the company under-estimated.

Not one penny of this expense would have been necessary had FPC left East Ohio alone under the regulation of the Ohio Public Utilities Commission. Who is paying for this needless expense? Why, the consumers of course. A regulated public utility has no method or means of getting money to pay any kind of expense other than through the rates paid by the customers. For rate-making purposes, expenses of this kind are usually allowed as an operating expense regardless of the opinion of the rate-making body as to the need for the expense. Concededly, the FPC has no jurisdiction to fix rates for East Ohio. That power rests first in the various municipalities where East Ohio serves and, in the final analysis, in the Ohio Public Utilities Commission.

What's The Purpose?

Since the FPC has no jurisdiction to fix rates for East Ohio, compliance with its orders serves little or no purpose for rate making because the rate base prescribed by the Ohio law is quite different from the one used by FPC. The Ohio law requires a reproduction cost new less observed depreciation rate base. The FPC is definitely wedded to a rate base made up of original cost from which is deducted the balance in the depreciation reserve account. It is quite conceivable that in a number of instances of a gas utility like East Ohio, the expense involved in making an original cost study and otherwise complying with FPC orders, could bring the company's net earnings below the fair return that the law allows and thereby bring about an increase in rates. It is also quite conceivable that in the case of other such gas utilities, the expense of complying with these FPC orders would pull down the net earnings of the company so as to prevent a rate reduction which would have been indicated had not FPC piled on additional operating expenses.

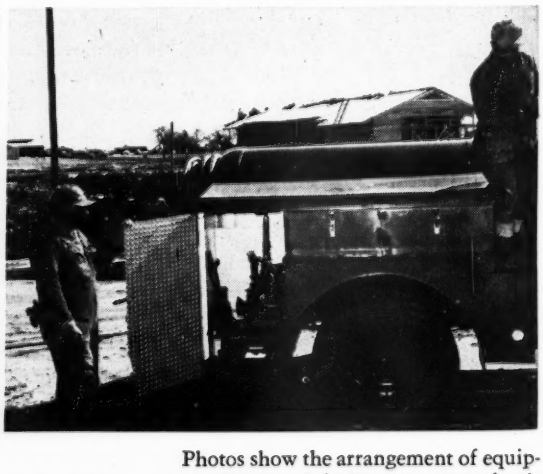
Magnify this problem that FPC has created for East Ohio by the 43 distributing companies that FPC says are similarly situated and subject to its jurisdiction in respect to reports and accounting, and you have an unwarranted burden upon the natural gas users of this nation that runs into many millions of dollars. What is to be done to remedy this situation? There is only one thing that can be done. Congress can now so amend the Natural Gas Act as to give back to the states the exclusive jurisdiction over the distribution and sale of natural gas within the respective states. It can confine FPC regulation strictly to the interstate pipelines' wholesale sales for resale. This is what Congress intended when the Natural Gas Act was first passed and it is what everyone thought had been done until FPC and the Supreme Court said otherwise.

The state regulatory commissions acting through their National Assn. of Railroad and Utilities Commissioners have been alerted to this problem. At their annual convention in Phoenix, Ariz. last November, they adopted a resolution spelling out in detail the exact language of amendments giving the Natural Gas Act the meaning that was first intended. The resolution further instructed representatives of the association to arrange for the introduction of a bill in the present 82nd Congress proposing the amendments. This has been done. On March 9, 1951, Senator O'Conor of Maryland for himself and on behalf of Senator Bricker of Ohio, introduced S. 1084 which is designed to accomplish what the state commissions have recommended.

Essential Legislation

This proposed legislation is essential to the preservation of our form of government. It is essential to the preservation of local self-government and should aid in reversing the trend toward concentration of all power in Washington. Those who have been aware of this trend of the last two decades to concentrate more and more power in the federal government to the detriment of state and local governments, and those who considered that such does not comport with the true principles of the Constitutional republic that our forefathers so carefully founded, should welcome legislation of the type of S. 1084.

By this kind of legislation we can, bit by bit, restore to the states their rightful place in the orbit of our originally intended form of government. This in turn would save millions of dollars for the taxpayers by elimination of duplicating governmental services, in addition to the savings to the rate payers heretofore mentioned. If we would tax and spend at the local levels of our government for the known local needs without shuttling our dollars through Washington to be returned in halves, we could all save money and the congestion in Washington would be relieved.



A compact, highly workable arrangement of earth boring equipment has been devised for Lone Star Gas Co., Dallas, on the specially constructed "Hydrauger truck" by W. P. Manigk, street department superintendent.

Included in the equipment are a 500-gal. water tank, a 125-cu ft air compressor, and a water pump, in addition to the earth boring apparatus itself.

Photos show the arrangement of equipment. View at left shows water tank, air compressor, and compact tool arrangement. At right is shown the cabinet for carrying the Hydrauger.

Are We Selling A Cubic Foot of Gas— OR ARE WE SELLING SERVICE?

By D. J. REIMERS

THE PROPOSITION that the gas industry is not simply in the business of selling a commodity, a fact that in our complete absorption with our own business we are sometimes prone to forget, is enunciated simply but forcefully by Mr. Reimers. Our product itself is not a concrete thing which can be viewed with feeling. It is an agent, nothing more; it provides a service of comfort, convenience, efficiency. It has no inherent value; the value lies rather in the operation of the equipment which it fuels. Thus its value is a fluctuating thing. In the final analysis two identical cubic feet of gas may have respective values of much and little.

So we cannot choose to ignore the one thing we are selling: service. And service resolves itself into a matter of equipment. Quality of that equipment and efficiency of operation are the really important competitive factors—not gas, the commodity—in relationship to competitive fuels. These factors must be maintained; and that, by whatever method might be employed, is a matter of control.

DO you sell a cubic foot of gas? This is the question that I feel we should all ask ourselves. If we find it to be true, we should then determine why it is so and what we intend to do about it.

First, I wish to state that from the gas industry's viewpoint, we should be only interested in selling a service. This is true whether it be a cooking service, a water heating service, a refrigeration service, a home heating service, or whatever type of service it might be. When we speak of "service," it is intended to mean a multiple number of functions.

Are your company policies such that they really intend to render a complete gas service? To Mr. and Mrs. Homemaker, this is primarily a management problem, but in most instances, it is a problem influenced by both the sales department and the operating department.

What do we mean by policies that give a complete gas service to our customers? These policies must do everything possible to educate our users in all of the numerous advantages of gas cooking service, gas water heating service, gas refrigeration service, and gas home heating service.

Complete Customer Service

In order to do this, we must first have our own office in every community, large or small, where the customer may come at all times to obtain information and discuss his needs or desires. Let's ask the customer to come into this office to pay his bills, so that at least once each month he has an opportunity to talk to a competent gas company employee—one who, by all means, is trained in explaining the various services offered. In smaller communities, let's not ask the customer to go to a butcher shop to pay his bills. Here the principal interest of both the customer and the merchant is the cost or the toughness of his meat. Let's not let him go to the bank where they both are more concerned about the customer's failure or inability to make a payment on his note.

After we have established a convenient office where the customer may readily contact his gas company, we must have the necessary personnel to see that he always receives a *complete* service. Do we tell the customer that appliance servicing must be obtained from a dealer? Dealers are in almost all instances experts in such fields as repairing pumps, cleaning clogged sewers, and numerous other odd jobs. Or do we tell the customer, "Our serviceman lives in another town but will be here next Thursday to change charts and will then make the necessary adjustments; however, in the meantime, dear customer, don't bake with your oven, and by all means, stop taking baths since it will be necessary for you to turn off your hot water heater."

Don't Sell Out

By no means let us sell out to the politicians and appliance dealers our obligation to serve our customers from the moment they become prospects. We can only accomplish this by being in a position to sell the prospect the merchandise as well as to give him the proper service after he has purchased the merchandise. This does not mean that we cannot have very successful dealer cooperative plans, but I am sure we can enjoy them only if—and as long as—the gas company actively remains in the appliance field with the dealers.

It is not my thought or intention to delve in any degree into the merchandising phase of the industry, but I do wish to emphasize that the education and the determination of the particular needs of every customer can best be handled with a well-trained sales and home service department within the gas company.

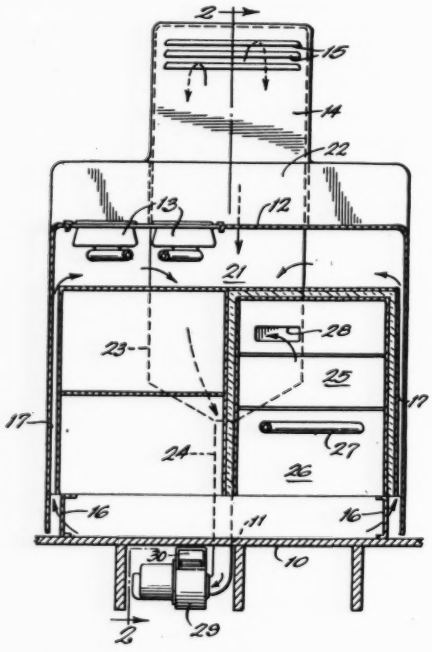
It is the duty and the responsibility of every salesman, as well as sales management, to use some of his personality and salesmanship on the management of his own company. Then policies can be formulated that will result in a complete gas service by a team of competent employees and not by a loose-knit organization composed of the gas company and a number of part-time dealers.

Of course, in order to accomplish this *complete customer service*, we must have in our organization in addition to an efficient sales force a competent installation department and a service de-

Mr. Reimers is associated with Minnesota Valley Natural Gas Co., St. Peter, Minn. This paper was presented at the Mid-West Gas Assn. meeting in Omaha, March 12.

Ventilated Range Awarded Patent

A ventilated range, so constructed as to facilitate the removal of products of combustion and to remain cool along the side and top portions, was recently awarded a U. S. patent.

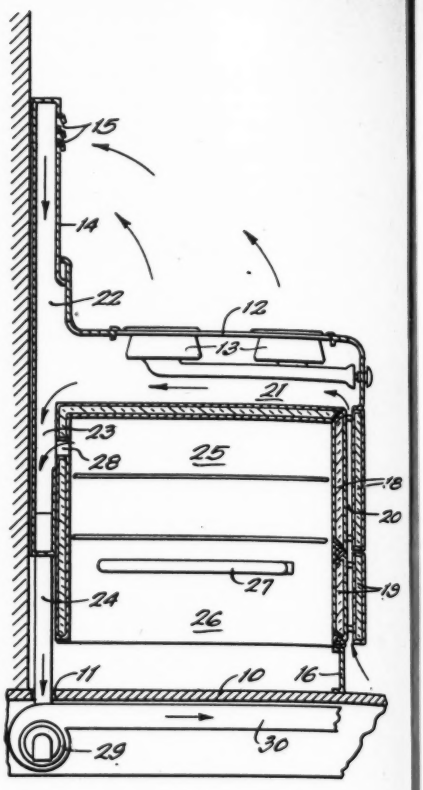


Inventors are James A. Nelson and Frederick J. Port Jr., of Cribben & Sexton Co., Chicago, which has been assigned the patent.

Elements of the range include a casing extending along the back of the rear wall, providing a downwardly extending exhaust passage; an inner casing providing an oven compartment "communicating" with the exhaust passage and providing a plenum chamber between the top of the casing and the range top; a hollow back splasher extending above the range top and provided with front ports for receiving vapors from the range top; and a blower communicating with the exhaust passage.

The inner casing is spaced from the side walls of the range to provide open passages extending from the bottom of the range and communicating with the plenum chamber. The bottom of the back splasher communicates with the plenum chamber and the exhaust passage. The blower is equipped with means for discharging material received from the exhaust passage.

Principal features of the range, as indicated by numbers in *Figs. 1 and 2,* include the back splasher (14) equipped with intake openings (15); an air passage (17) on each side of the range formed by the casing walls; an air passage (20) formed between the doors; chamber (21) which joins vertical passages (22) and (23), the latter connecting with a pipe (24) which in turn leads



to a hole in the floor (11); short passage (28) connecting the oven compartment with the downward passage (23); the blower (29) which discharges through pipe (30) leading outside.

partment capable of properly adjusting all appliances. These employees should be well trained with the ability to fully demonstrate the equipment and answer all questions which the customer might ask.

Third, we must have a home service department that is expert in the field of demonstration. A few days after an appliance has been installed, this department will make a follow-up call at the home. The representative will then be able to answer any questions that the customer, who by now has used the appliance for a few days, may present.

Worth the Investment

You perhaps now may ask, "Can my company afford a home service department?"

My answer to you is, emphatically, "Yes." No company is too small to afford it. The home service department is a very necessary part in giving and selling the customer a complete gas service.

I firmly believe our existence in the gas business is very much dependent upon our interpretation and offering of this complete service.

One of the things that is helping to bring this more forcibly to mind is the devaluation of our dollar. A few years ago, we could point out the saving of a dollar a month over competitive fuels, and it meant something to the prospect. Today, the dollar means so little that our prospect wants to know what our gas service will do for him that some other fuel cannot do. Last, but not least, the customer asks, "What service may I expect?"

With the tremendous expansion of the natural gas pipeline companies, it does not appear to me that the distributors have received from the pipeline company the fullest cooperation in establishing good, sound, and proper policies in the marketing of their product to the ultimate consumer. This is particularly true when the pipeline company distributes gas through its own distribution company directly in competition with other distribution companies. What I am attempting to say is that these distributing companies owned by the pipeline companies should be the *leaders* in raising the standards of the service that their product is capable of presenting to the public.

We are also handicapped, in a number of cases, where we encounter combination gas and electric companies, whether they be privately owned or publicly owned. When the management is principally electric-minded—which is generally the case—the prospects are never given the opportunity to become properly acquainted with the advantages of gas service. The prospect is left no alternative but to accept the electric propaganda that is so well sponsored. Should the prospect desire and eventually purchase a gas range or water heater, he soon discovers that proper service is difficult to obtain and he must be satisfied with the limited service that he is able to procure from a dealer.

What the Customer Buys

In closing, I would like to place a challenge before you as gas utility men. If you are willing to sell gas cooking service, gas water heating service, gas refrigeration service, and gas home heating service—and by that I mean, if you are willing to sell a 100% gas service against which our competition will continue to be helpless when it comes to customer satisfaction, remember—

You Don't Buy Glasses—You Buy Vision

You Don't Buy Paper—You Buy News

You Don't Buy Circus Tickets—You Buy Thrills

The Customer Doesn't Buy a Cubic Foot of Gas—He Buys Service

Impressed Current Ground Beds for CATHODIC PROTECTION

An evaluation of their performance by A. W. PEABODY

Steady growth in the application of cathodic protection in distribution systems, reflecting widening management acceptance, has focused attention on the various agents available. One class of equipment includes those devices which are used to introduce current into the ground from an outside source, such as a rectifier, as distinguished from those employing galvanic anodes of zinc, aluminum, or magnesium, which generate their own current.

It is with materials falling in the former classification that the author is concerned in this article, an adaptation of a paper presented before the AGA distribution conference in Memphis last April. In his own words, "The intended scope includes a discussion of the development and present practices pertaining to ground bed materials and construction methods, the effects of soil condition and anode configuration on ground bed performance, and some of the factors involved in selecting suitable sites and designing ground bed installations."

Included are reports of tests conducted by the National Assn. of Corrosion Engineers' committee on anodes for impressed currents, a four-year program on the relative performance of carbon, graphite, and steel anodes in various backfills.

Mr. Peabody is associated with Ebasco Services.

WHEN cathodic protection of gas transmission lines was first practiced on a practical basis in the early '30s, the usual sources of protection current were rectifiers, windmills, and gas engine generators. The direct current from these sources was connected between the pipeline to be protected and a ground connection, or "ground bed," on which the current was impressed and forced to flow into the ground.

The most obvious material to use for these ground beds was scrap metal readily available from the junk pile. A great number of ground beds have been built using scrap steel pipe, scrap cast iron pipe, and old machine blocks, flywheels, and the like. It was generally recognized that these ground beds would be consumed at the rate of about 20 lb per ampere per year and that it was necessary to provide enough weight of metal to give a reasonable life expectancy consistent with the ampere output of the protection current source installed. The design of groundbeds, however, was otherwise often on a hit-or-miss basis with poor utilization of material to attain the desired low contact resistance with earth.

Costs Pose Problem

After ground beds utilizing scrap metal had been in operation for a few years, it became apparent that there were many attendant disadvantages which resulted in high maintenance cost. Steel pipe or rail anodes would not be consumed evenly and were often eaten in two at a point close to the wire leading to the rectifier with the result that the anode was essentially useless even though the greater part of the anode material was still in the ground. Cast iron pipe and machine castings became graphetized upon corroding and thereby became so weak, structurally, that electrical connections to them continued to break away.

In one of the earliest attempts [1] to avoid some of the disadvantages to be expected from the use of scrap metal in ground beds was the installation of an extensive protection application in Louisiana by the Interstate Natural Gas Co. utilizing rectifiers as a current source and ground anodes of carbon rod surrounded by a backfill of coal coke breeze.

Carbon was used for these ground anodes because its theoretical rate of consumption by discharged current is only about 2 lb per ampere per year as contrasted with the 20-lb figure for iron. In addition, it was believed that a portion of this consumption would be borne by the cheap coke breeze backfill rather than by the carbon core rod. Performance of these carbon rod anodes was very satisfactory and was one of the first clues that has led to the development of reliable and long lived ground beds.

Another development similar to the use of carbon rods involved the use of small steel pipe cores backfilled with coke breeze. The object of this type of construction was to surround the steel core with a uniform medium which would tend to promote even consumption of the steel plus the more important objective of attempting to transfer the greater part of material consumption from the steel core to the surrounding coke breeze which would be used up at the characteristic slow rate for carbon. Performance of this type of ground bed has been somewhat unpredictable with encouragingly long life indications at some installations and early failure at others.

NACE Investigations

In 1947, the National Assn. of Corrosion Engineers formed a committee on "Anodes for Impressed Currents," a subcommittee of the technical practices committee. This committee has undertaken a four-year program of closely supervised field tests with the object of procuring conclusive data on the relative performance of carbon, graphite, and steel anodes in various backfills.

Test sites were selected on several different properties with varying soil conditions represented. At each test site, four each of three or four different types of anode installation were made in order that one of each type might be removed for inspection each year for the four-year duration of the test pro-

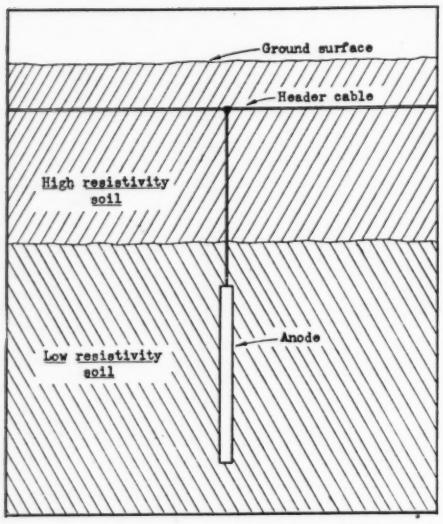


Fig. 1. Placement of vertical anodes for best performance in low resistivity soil underlying high resistivity soil.

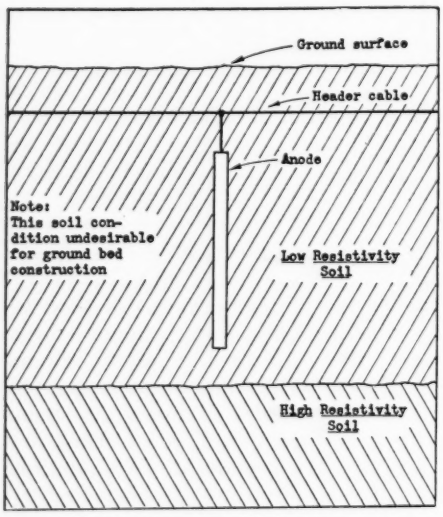


Fig. 2. Placement of vertical anode for best performance in low resistivity soil over high resistivity soil.

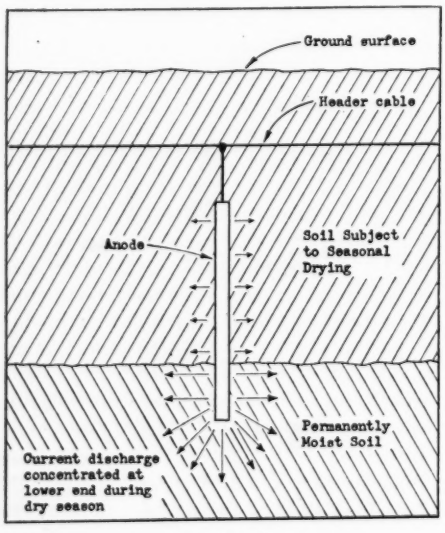


Fig. 3. Effect of seasonal soil changes on performance of vertical anodes.

gram. Although at the time this paper was written, only three annual inspections had been made on the oldest of the test installations, much valuable data has been obtained from which preliminary conclusions may be drawn.

Some of the findings will be discussed here. More complete information may be obtained from an interim report issued by the committee[2] which has been published and is available through the National Assn. of Corrosion Engineers.

Anode Performance Checked

In the tests, the performance of steel anodes was checked with natural soil backfill and coke breeze. Carbon anodes were checked with backfills of natural soil and coke breeze. Graphite anodes were checked with backfills of natural soil, coke breeze, coke breeze and lime, graphite, graphite and lime and a soil-gypsum mixture. At each annual inspection, representative anodes were removed and carefully inspected for deterioration. Any deterioration observed was compared with the theoretical rate of consumption to be expected from the current output of the anode from the time installed until the time removed. Where possible, this current output was checked monthly throughout the test period.

Steel anodes in natural soil backfill have been found to be consumed at from 104% to 106% of theoretical rate for three anodes while a fourth, operating at higher current output, failed completely in the first year.

The weight loss of six steel anodes in coke breeze backfill ranged from 16% to 79% of theoretical loss. At each yearly inspection, the anodes with the higher weight loss were in the wetter locations. Two other steel anodes in coke breeze or graphite backfill have been removed for inspection. Although accurate current output records were not obtained, the anodes were both heavily attacked.

The performance of both carbon and graphite anodes in carbonaceous backfills (coke breeze, coke breeze and lime, graphite, or graphite and lime) has been very good in the test ground beds. The majority of the rods removed for examination has indicated practically no deterioration after one and two years in service even though steel anodes in the same beds have suffered heavy damage.

In one location only, graphite anodes in carbonaceous backfill were found to be affected. In this instance, the soil at the ground bed location had completely dried out except for a few inches at the bottom of the anodes. This resulted in a very heavy concentration of current (about three times the recommended value) which caused the lower ends of the graphite rods to become softened and with some tapering but no loss of length. No carbon rods were installed in this bed but a steel anode in carbonaceous backfill was heavily attacked.

Both graphite and carbon anodes when installed with natural soil backfill have indicated some deterioration when removed for examination. This deterioration has been in the form of softening of the anode material in localized areas on the rods and rounding off of the corners at the lower ends of the anodes. Although the attack has been severe as compared to similar rods installed in carbonaceous backfill, the actual material loss has been very small—so small that weight loss measurements were not practicable. The probable maximum life is much greater than for steel anodes with or without carbonaceous backfill installed under the same conditions.

Graphite or carbon rods in carbonaceous backfill have lower resistance to earth than similar rods in natural soil, as is desirable. The test results have also shown that at any given test site they have a lower effective resistance than steel anodes of similar size with either natural soil or carbonaceous backfill.

Some of the carbon and graphite anodes were installed in coke breeze or graphite backfill to which lime had been added to serve as an alkalizing agent in order to observe any beneficial effect on anode performance due to reduction of acidity at the anode surface. Although the tests to date have not indicated any obvious difference in performance (other than reduction of the anode surface acidity), the maximum life of anodes so treated can be expected to be somewhat greater.

Carbon and Graphite Best

Backfill of coke breeze and gypsum used with graphite anodes has not been promising. Softening of the anode material plus rounding off of corners has been observed on rods removed for inspection. The tendency to deteriorate appears to be much the same as observed when such anodes were installed in natural soil backfill.

As is obvious from the preceding discussion, the NACE tests to date indicate that carbon or graphite anodes in carbonaceous backfills (such as coal coke breeze) are a superior type of ground bed anode for impressed currents and, if properly installed, can be expected to give long life with resulting low maintenance costs for ground bed installations. In addition to the interim report of the NACE ground bed committee previously referred to, reports are planned after completion of the current test program which will completely analyze and evaluate the findings.

Chemical Ground Bed Anodes

Some experimentation has been done on the development of so-called chemical ground bed anodes in which the metal anode is not subject to deterioration by the current being discharged from it. Such an anode might consist of an iron strip suspended in a concentrated caustic solution such as sodium hydroxide which is contained in a porous non-metallic container buried in the earth. If the solution concentration is maintained, the iron strip to which the current is fed will not be consumed. The chemical solution will, however, be used up.

In practice, the drawbacks to the use of this type of anode include the necessity of maintaining the quantity and concentration of the chemical solution as well as finding solution containers which will permit free passage of the anode current and still effectively retain the solution. This type of anode would have to be so installed that the top of it could always be easily reached for check and replenishment of the solution. Because of the above limitations, the use of chemical anodes does not appear to be practical at the present time for general use in run-of-the-mill ground bed installations.

Ground Bed Installation Practices

In addition to the type of anode material used in ground bed construction, the type and manner of installation of header cables between the anodes and rectifier is important for trouble-free ground bed performance.

If, as is probably true in the majority of ground bed installations, a buried cable is used to interconnect the ground bed anodes and run from them to the rectifier, this cable is subject to current discharge and corrosion at any breaks or other points of leakage in the insulation. Any such corrosion will eventually sever the cable and disconnect part of all of the ground bed from the rectifier or other current source used. For this reason, it is essential that the best grade of insulated cable be used for header cables in order to insure long operating life. A type of insulated wire currently being used for this purpose has corona-resisting rubber insulation with an outer jacket of Neoprene or similar material. The corona-resisting rubber insulation, although normally associated with high voltage alternating current applications, is thought best suitable for long life underground and with direct-current applied potentials. The tough outer jacket is adequate protection for the cable when buried directly in soil if reasonable precautions are taken to exclude rocks or sharp debris from the backfill that will contact the cable. This type of cable is a standard item with all major manufacturers of insulated wire.

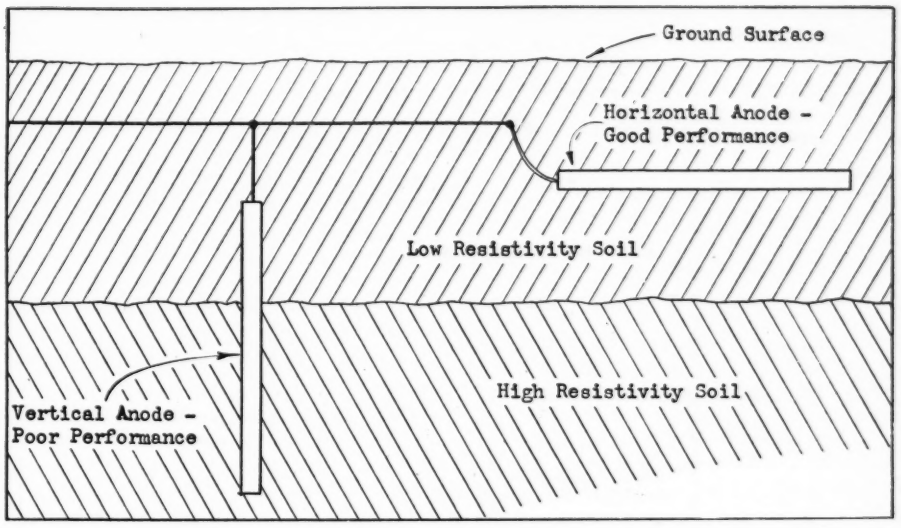


Fig. 4. Vertical anodes vs. horizontal anodes in thin low resistivity soil stratum.

Underground connections between anode leads and the header cable or splices in the header cable must be carefully made and well insulated. Good practice calls for either soldered connections or connections made with Thermit-type welding equipment. These connections must be well insulated. This is normally accomplished with several half-lapped layers of the best quality high-voltage rubber tape which is in turn covered with vinyl or polyethylene tape. The rubber tape must be effectively bonded to the rubber insulation on the wire while the outer plastic tape must extend over the jacket material.

Operating Performance

In the installation of the ground bed anodes themselves, care is necessary to insure full operating performance. It is important that backfill material surrounding anodes be fully compacted by tamping in order to obtain the lowest possible contact resistance and hence the highest possible current output with a given applied voltage. This compacting is particularly important in the case of coke breeze backfill in order to eliminate, insofar as possible, air voids between the backfill particles.

If wire connections are to be made to anodes of pipe or other scrap steel, these connections should be soldered or made with the Thermit-type welding process and the connection as carefully insulated as all other connections in the buried system. If this insulation is not effective, the connection may be expected to deteriorate rapidly and eventually cause the anode to become disconnected from the rest of the ground bed.

In procuring coke breeze for use with ground bed anodes, it is important that coal coke breeze of calcined (heat treated) petroleum coke breeze be obtained. Petroleum coke breeze which has not been calcined has relatively high electrical resistivity which, if used with ground anodes, will result in higher anode-to-earth resistance. This will in turn limit the amount of current output from the anode.

As was apparent from the discussion of the NACE ground bed tests, it will normally be the best practice to use coke breeze or other carbonaceous backfills whenever graphite anodes are installed in soil. If coke breeze is not used, anodes in some very dense soils will not perform satisfactorily because the tight soil will prevent dissipation of gases generated at the anode surface. This gas-blocking will cause marked increases in anode-to-earth resistances. A typical example of this condition has been reported in detail by Emerson.[3]

In using graphite anodes, there are certain limitations concerning current density at the anode surface. At present, the recommended maximum current densities are 0.25 ampere per sq ft of anode surface if earth backfill is used and 1.00 amp per sq ft if carbonaceous backfill is used or if the anode is suspended in sea water.

Effect of Soil Conditions

Soil conditions at a proposed ground bed site can have a marked effect on the performance of anodes installed at that location. Some of the conditions which must be considered are discussed below.

From the standpoint of uniform results and maximum anode performance, ground bed anodes should be installed in soil of uniform electrical resistivity from the ground surface down to considerable depths (as much as 150 ft or

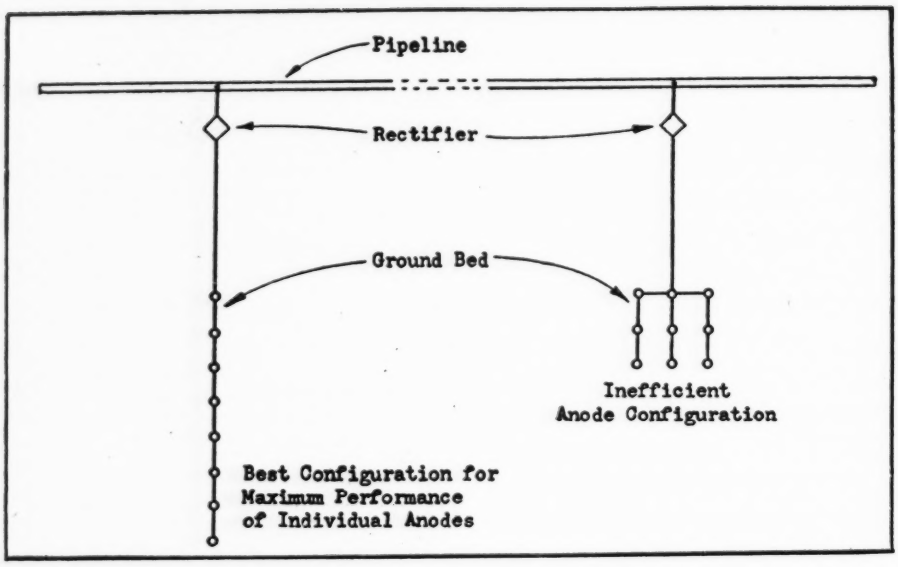


Fig. 5. Effect of ground bed configuration on anode performance.

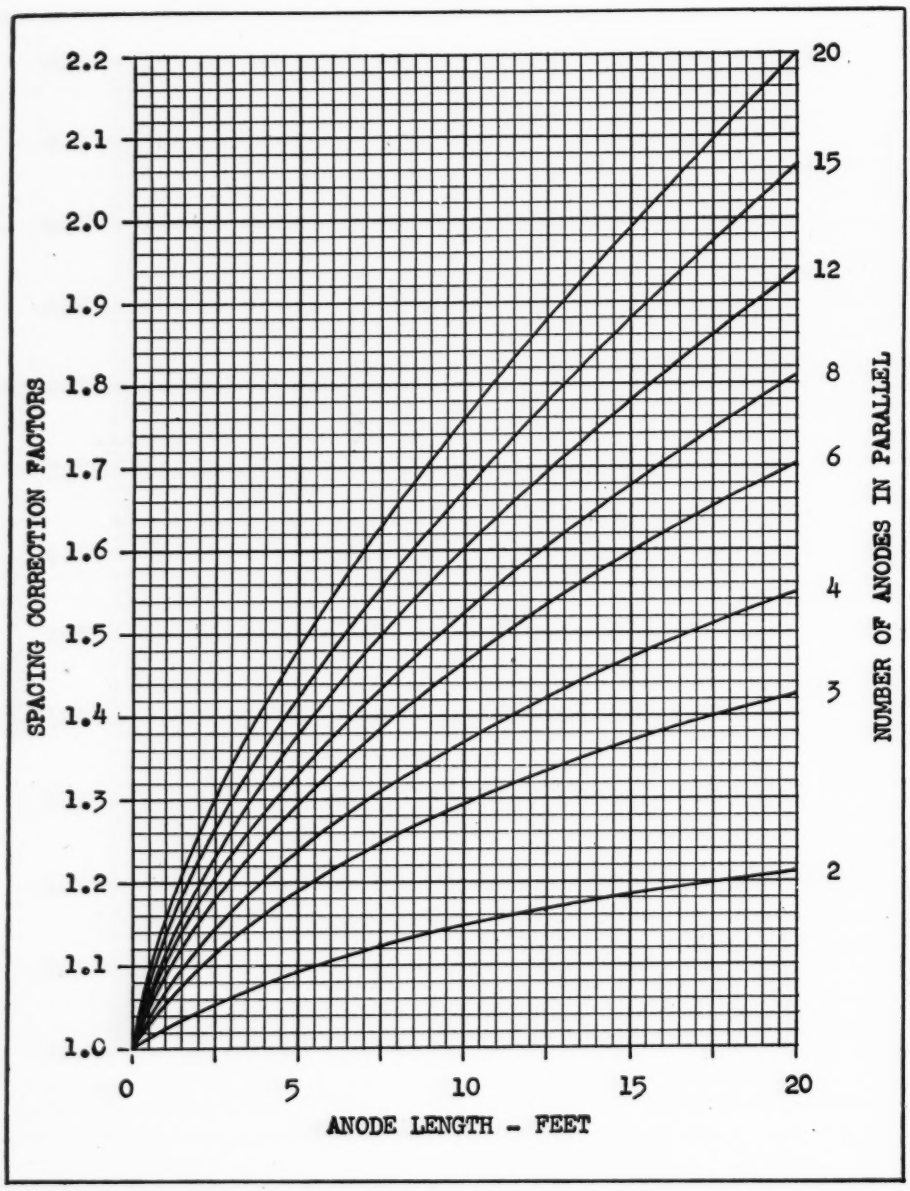


Fig. 6. Spacing correction factors for design of ground beds using vertical anodes with 15-ft spacing.

more). This condition may be practically impossible to find, but sites which more closely approach this ideal will give the better performance.

It will often be necessary to install ground beds in areas where the soil structure consists of two or more strata with different electrical resistivities. It is then desirable to have all of each anode in one stratum of reasonably uniform resistance. As shown in *Fig. 1*, if high resistivity surface soil covers low resistivity soil, the ground bed anodes should be installed below the surface layer even though it may mean augering anode holes a number of feet deeper than would otherwise be the case. The performance of anodes installed in this manner will normally be good.

If, on the other hand, a layer of low resistivity surface soil of limited thickness is found overlying high resistivity material as shown in *Fig. 2*, the anodes may be installed in this surface layer. The resistance to earth of anodes installed in this manner will not be as low as anodes installed under the conditions of *Fig. 1* even though the electrical resistivity of the soil containing the anodes is the same in both cases. This is because of the fact that the underlying higher resistivity material limits the penetration of ground bed current into the earth. Where solid rock closely underlies soil in which anodes are installed, the effect may be very great and will require very large ground beds in order to obtain a sufficiently low overall resistance to absorb the full output from even a small rectifier.

If ground bed anodes are installed in soils which are subject to severe drying out during dry seasons, as shown in *Fig. 3*, the performance of the anodes will be adversely affected. During the wet season, the soil may be of reasonably uniform resistivity throughout the length of the anode and performance will be normal. During the dry season when the soil surrounding the upper part of the anode dries out, the resulting rise in soil resistivity in that area will cause the anode output current to concentrate at the lower part of the anode with possible rapid deterioration. After a few seasonal cycles of this type, the lower portions of the anodes may become so deteriorated that the ground bed will be of little value during the dry seasons.

Design Affects Performance

Although the majority of the ground beds installed employ anodes placed in a vertical position as shown in *Figs. 1, 2,* and *3*, it is advantageous under some conditions to install the anodes in a horizontal position. As shown in *Fig. 4*, if a ground bed must be installed in an area where the accessible low resistivity soil is in a relatively thin stratum,

installing the anodes in a horizontal position is the only way in which they can be surrounded with uniform soil and thus obtain reasonably uniform current output density over the entire anode surface.

In designing such a ground bed, it is desirable to avoid having the anodes at a level which is close to either the surface or the top of the higher resistivity underlying the soil. If the anodes can be placed at about the mid-level of the low resistivity stratum and still avoid drying out from the surface during dry seasons, the best all-around performance will be obtained. The resistance to earth of a horizontal type ground bed installed over high resistivity underlying material will never be as low as if it were installed in uniform soil.

Anode Spacing Important

In planning a ground bed, the best configuration for the anodes will normally be a straight line rather than a group in a limited area as illustrated in *Fig. 5*. The spacing between anodes is also important since the overall resistance to earth of the ground bed is lower with increased anode spacing. This overall resistance is ordinarily determined by dividing the calculated resistance of a single anode by the number to be placed in parallel and then multiplying the result by a correction factor determined from the number of anodes and the planned spacing between them.

Fig. 6 illustrates correction factors for various lengths and numbers of vertical anodes at 15-ft spacing which is a value commonly used. Holsteyn[4] has published curves of a similar nature. The resistance to earth of a single anode can be determined from curves based on formulae by Dwight[5] and which have been published in various papers including the one by Holsteyn previously referred to. These curves are based on the resistance of an anode in soil of 1000 ohm-cm uniform resistivity. Resistance in soils of other resistivities are determined by direct proportion. If, for example, the soil in which anodes are to be installed has a resistivity of 2000 ohm-cm, the resistance to earth of a single anode will be twice the value as determined from the curves.

Selection of Sites

In selecting a site for a ground bed, there are a number of factors which have to be kept in mind. The location should be reasonably close to the center of the section of transmission main or distribution system which is to be protected, a source of power should be readily available if rectifiers are to be used as a source of current, right-of-way should be readily available and the area not subject to residential or commercial development for a reasonable number of years, the area should be remote from unprotected foreign lines, and finally the soil resistivity should be suitable for construction of a ground bed that will give adequate performance at reasonable cost. In many cases, it is necessary to effect a compromise with one or more of the above factors in making the final selection.

Thorough soil resistivity measurements are essential for proper ground bed design. These measurements are ordinarily taken using test procedures which with all readings taken at the surface, will indicate the average soil resistivity to various depths. Information so obtained will indicate whether or not the soil is of uniform resistivity and will indicate the approximate point at which marked changes in soil resistivity occur. This information is of particular value in determining at what level the anodes will be placed and whether they will be vertical or horizontal as has been previously discussed.

When planning ground bed installations for use in protected distribution piping systems in congested areas, it is the usual practice to utilize small rectifiers in order that the size of the required ground beds will be as small as practicable. This policy is ordinarily dictated by limitations in space available for the ground beds plus the desire to keep the amount of current pickup by adjacent foreign unprotected structures as low as practicable so that required protective measures for such structures will not be excessive.

Conclusion

Because of rapid progress in the past few years, the performance of properly installed ground bed anodes of the correct type has reached a relatively high level as it is now possible to install anode systems with reasonable assurance that they will operate as expected. Nevertheless, much additional work and experience is required to increase available knowledge concerning ground bed construction with the goal of maximum life, minimum cost, and freedom from maintenance.

References

1. Rhodes, G. I. Electric Pipeline Drainage. *Electric Journal*, Feb. 1936.
2. First Interim Report on Ground Anode Tests of Technical Practices Committee No. 3. Anodes for Impressed Currents. Publication No. 50-1, National Assn. of Corrosion Engineers.
3. Emerson, R. J. Experience With Two Graphite Ground Beds in Dry Lakes. *Corrosion*, March 1950.
4. Holsteyn, Derk. Locations and Materials for Anodes for Impressed Current. Cathodic Protection—A Symposium. Published by National Assn. of Corrosion Engineers.
5. Dwight, H. B. Calculation of Resistance to Ground. *Electrical Engineering*, Dec. 1936.

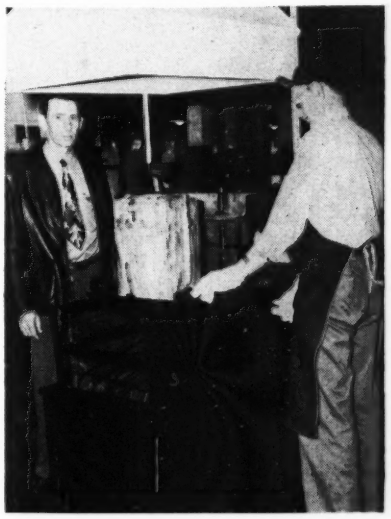
An Operating Kink

Heat Table for Dismantling Meters

A great help in the testing and repairing of tin case meters at the Oklahoma City meter shop of Oklahoma Natural Gas Co. is a heat induction table, recently developed, which removes front, back, and top plates from the meters.

A metal framework table about 4 ft by 18 in., it is constructed principally of ½-in. steel pipe. On top of the table is a carrier on which the meter is mounted. This convoy can be moved back and forth by hand so that the meter plate passes directly over a gas flame burner and the plates are melted off.

With this new device one man can remove top, front, and back plates from approximately 20 meters an hour. The meters are moved up to the table on a small truck and a constant flow of the measurement devices can be kept passing over the flame. James



James Ferguson (left) watches Freeman Leonard operate hand control of convoy which carries meter back and forth over flame. Hood over table carries fumes to ventilating system.

Ferguson, meter shop supervisor and inventor of the table, has devised two types of burners to handle 5-a and 10-a meters. The gadget saves the time of two men in the operation, an important saving since 30,000 tin case meters move through the shop each year. In addition, it has whipped the salvage problem of plates being bent and ruined by the old method of using soldering iron and screw driver.

The work is less tiring and involves less risk to health because fumes are carried upward through a hood over the machine to a connection with the regular ventilating system for the shop.

This is only one of several labor saving devices worked out by Mr. Ferguson. Another outstanding invention is a repair table to which the meter can be clamped by means of a swivel so that the meter can be turned in any direction while being repaired, eliminating the necessity of manhandling it and the danger of knocking it off on the floor.

HAND TOOLS

New labor-, time-, money-saving developments in

Tools—Equ

By J. E. TURNER

A survey of companies in the Pacific Coast Gas Assn. was recently completed to determine what new developments of interest in equipment, tools, and methods have been made during the last three years in the field of customer service. Herein are reported new

Because of the constant changes in appliance design, a continuous review of the hand tool inventory is found necessary by every company engaged in appliance servicing to effect efficient and satisfactory completion of all work performed by servicemen. This, of course, means removing ineffective, seldom-used tools as well as adding new or modified tools to hold the number of tools necessary for efficient work down to a point where they can be carried in a standard tool kit.

The following three tools that are supplied to servicemen of the Mountain Fuel Supply Co., Salt Lake City, have proved their worth:

Fig. 1

"Tee-head" Orifice Wrench. A 9/16-in. open end tappet wrench *(Fig. 1)* is used primarily for adjusting Estate ranges. By removing the valve handles, the serviceman can reach through the valve opening and adjust the burner without removing top grates and burners.

Fig. 2

Screwdriver. The type shown in *Fig. 2* is used for adjusting oven pilots and oven minimum flame settings. This tool is specially designed to prevent its slipping off the adjustment screw, as the adjustment is made while watching the flame.

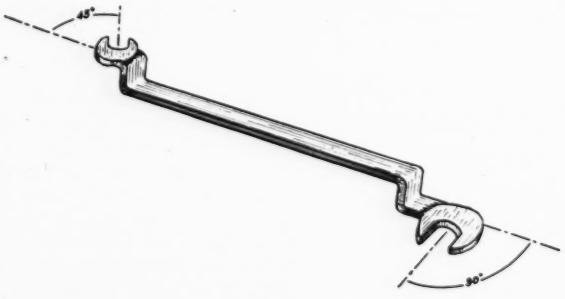


Fig. 3

Offset Orifice Wrench. A 9/16-in. double end orifice wrench with opposite offset at each end is shown in *Fig. 3.* One end is formed at a 45° angle, the other at a 90° angle.

The first two tools are stock items modified in the company's own shops; the third can be purchased from a well-known range manufacturer.

Tool changes and additions made by Southern California Gas Co., Los Angeles, are the following:

Arbor Chuck. This tool is supplied to all servicemen to replace the wooden-handle No. 151 Anderson & Forrester reamer handle as well as the large pin vise. It is used for holding large and industrial reamers as well as size 77 and larger drills.

During the Blythe and Indio (California) changeover, when this tool was first used extensively, it proved to be much more satisfactory for holding drills than the pin vise. The handle of the arbor chuck can be so positioned as to spin on the shaft, which is an advantage when small drills are used. The handle can be shifted back on the shaft in a locked position when the chuck needs to be opened or closed, or when larger drills or reamers are used. *Fig. 4* shows the handle cut in two pieces indicating the pin and slot that allow the handle to remain in a locked position or move to a "free wheeling" position.

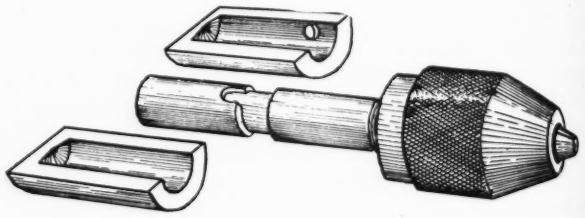


Fig. 4

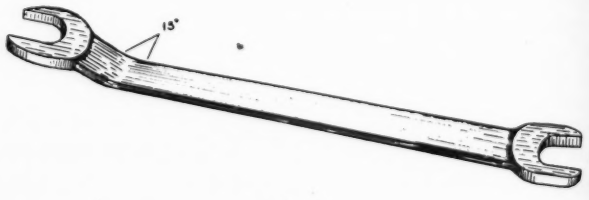


Fig. 5

Orifice Wrench. A ½-in. x 9/16-in. open end wrench *(Fig. 5)* is altered by offsetting the 9/16-in. end 15° and by grinding down the jaws to permit the use of the wrench in restricted locations.

Manometer Cone Attachment. This pressure-taking device *(Fig. 6)* has two alterations. The first tapers the cone to 15/32 in. which is somewhat smaller than before and permits the use of the cone attachment in taking pressures from any pipe outlet down to ½-in. opening.

The second alteration was to insert a brass spud orifice, drilled with a size 80 drill, in the tubing approximately 1 in.

Equipment—Methods

Coast Counties Gas & Electric Co.

ideas in hand tools, truck equipment, and methods. Mr. Turner, who is service supervisor for Coast Counties at Concord, Calif., presented this paper at the PCGA customer service conference in Berkeley, Calif., April 26-27.

above the rubber cone. This permits taking the pilot flow as well as lockup and normal flow pressures.

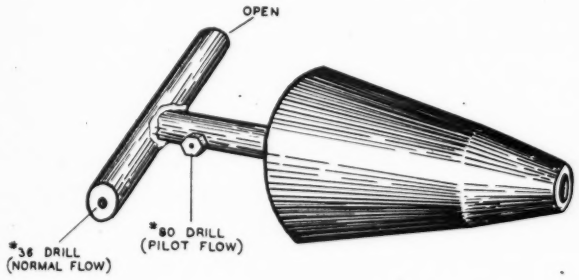


Fig. 6

Servel Door Gasket Kit. This installation kit contains a Lodi belt punch, No. 2 Phillips stubby screwdriver, a No. 908 Wiss pruning shears, a template (available from Servel) and miscellaneous clips, washers, etc.

The kit is not carried by servicemen on the truck at all times but is drawn from the storeroom each time an order to replace a door gasket is received. This saves stocking all trucks with the tools and materials required for the job.

Regulator Orifice Wrench. This tool is made from a ½-in. hexagonal steel rod with one end ground down to 7/16 in. It is approximately 4 in. long and is used for changing orifices in small Reliance and Modern regulators.*

Truck tools and special tools made available for servicemen's use depend somewhat on the limits of service extended by company policy.

Vacuum Cleaner. The San Diego Gas & Electric Co. has made tank-type vacuum cleaners with suitable nozzles available to servicemen for the past two years and reports a 50% time saving in cleaning dust and lint from the cooling system and burner compartment of Servel refrigerators. The cleaners effect an equal time saving in removing soot from combustion chambers and flues, and a much safer and cleaner job. This is an important saving in time where service policy permits such extended service.

Seattle Gas Co. also provides vacuum cleaners for servicemen's use, presumably for this same type of work, and also has available electric drills and M.S.A. explosimeters for special use. In addition to regular issued tools, the company is now providing inspectors and heating servicemen with stop watches.

*Some of the above listed tools are supplied servicemen on an optional basis.

Truck Tool Box. A new design in the truck tool box has been adopted by Pacific Gas & Electric Co. The boxes are installed on both panel and pickup service trucks operating in the San Francisco division. *Figs. 7, 8, 9* and *10* show the pickup truck equipped with these boxes.

Fig. 7

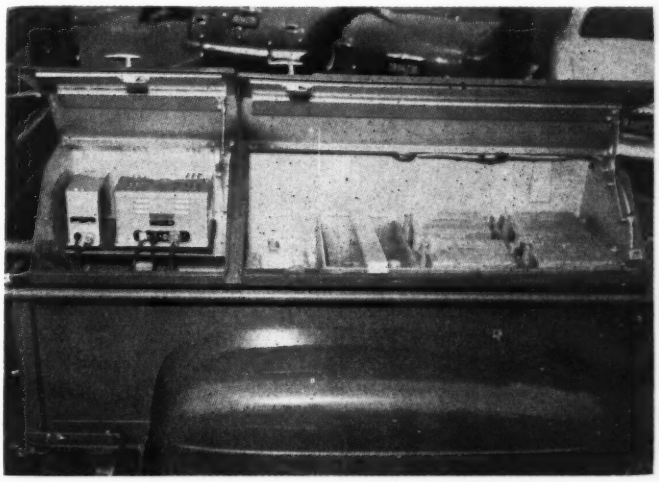


Fig. 8

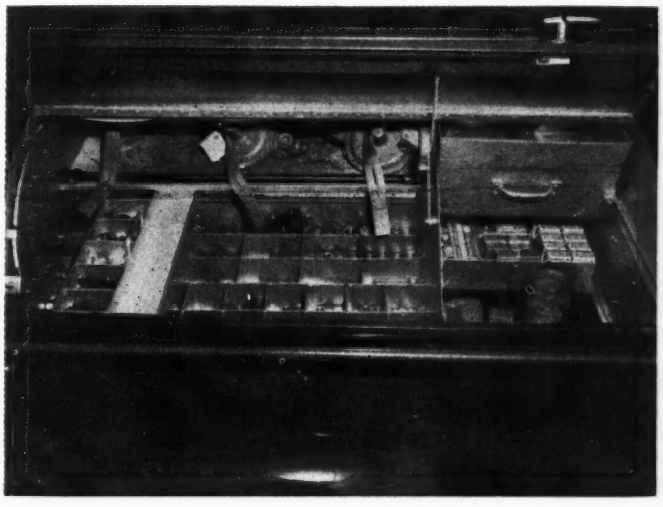


Fig. 9

Fig. 10

Meter and Regulator Holder. Faced with the burden of a high number of periodic meter changes in 1949 in conjunction with a rapidly expanding system, Coast Counties Gas & Electric Co., San Francisco, designed a meter holder and a regulator holder that could be easily attached or removed from customer service trucks as needed (see *Figs. 11, 12, 13, 14,* and *15*). These holders have proven very satisfactory

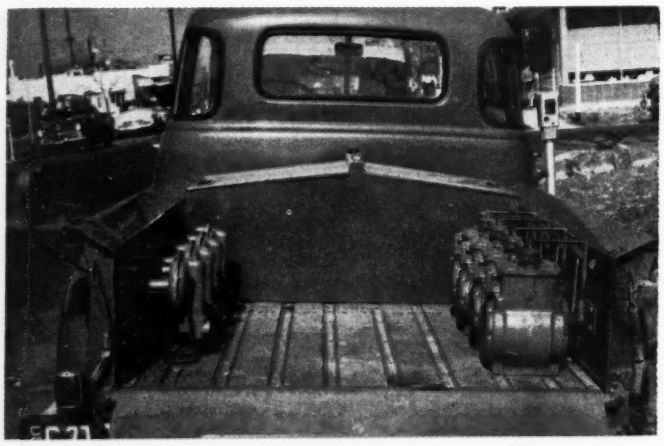


Fig. 11

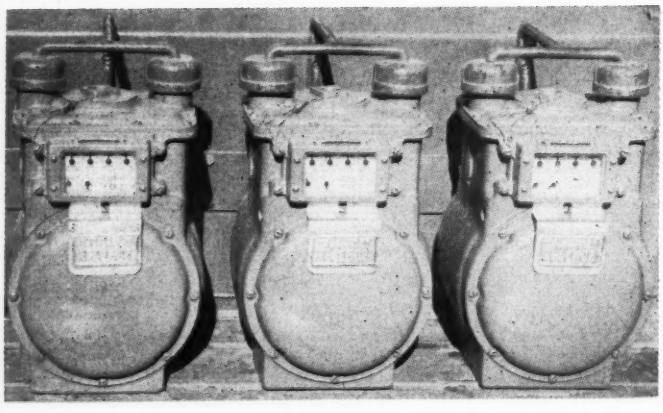


Fig. 12

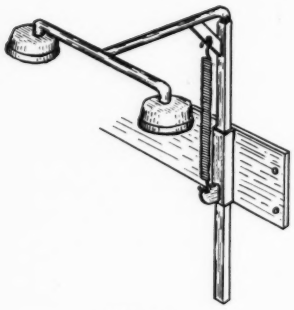


Fig. 13

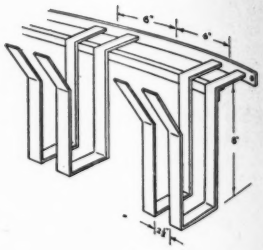


Fig. 14

and, because of them, Coast Counties has been able to continue to use the same tool, fitting, and meter box, avoiding the expense of re-designing and installing new and larger boxes. *Fig. 13* is a drawing of the meter holder shown in *Fig. 12*, and *Fig. 14* is a sketch of the regulator holder shown in *Fig. 15*.

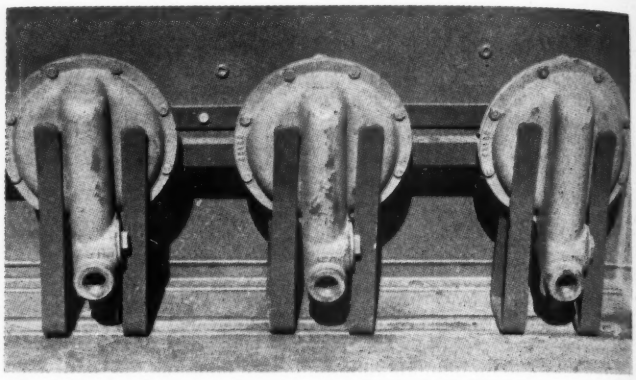


Fig. 15

METHODS

It is obvious that changes in methods and procedures affecting customer service work more than any other single factor are responsible for effecting the most extensive savings in this department, and in many instances effect savings to other departments as well.

Prefab Meter Sets. Southern Counties Gas Co. made a study of prefabricating the inlet side of all meter sets. This study indicated a definite saving to the company in setting meters and the practice has been approved and adopted. The prefabricated portion of the set includes the regulator (where gas is served at high pressure), a type "B" filter, and all fittings from the ¾-in. x 2-in. nipple that screws into the riser stop-cock to the meter cap that connects to the inlet side of the meter.

Leak Testing. In working customer orders and meter orders, a definite saving in time has been effected by permitting Southern Counties servicemen to flash test for leaks with matches when the following conditions prevail:

1. Odor not readily detectable.
2. Escaping gas cannot be heard.
3. Not near a wall or floor opening.
4. Inflammable material not in the immediate vicinity.

Pressure Tests. Approximately two years ago both Southern Counties and the Southern California Gas Co. discontinued taking pressures on customer orders except for special investigation, high bill or pressure complaints, or when placing a new regulator in service. If servicemen observe fluctuating pressures they of course investigate and correct the trouble.

Change in Leak Order Procedure. Discontinuance of the policy of spotting meters on leak complaints except where leakage cannot be isolated was decided upon. An example of this is where an odor of gas is reported near an appliance and the serviceman finds and repairs a leak at this appliance. The meter is not clocked for further leakage.

Meter Dial Glass Procedure. The policy of replacing broken dial glasses on meters was discontinued. This change in procedure is the result of having replaced many dial-glasses only to have them broken again in a relatively short time. It is felt that the need for a replacement glass does not justify the cost of making continued replacements.

New Procedure for Handling Seasonal "Ons" and "Meter Closes." Leave meter on during summer months for "heating only" customers. No bill should be rendered until the gas consumption accumulates to 1000 cu ft. This permits the customer to use the heater when heat is needed without paying the minimum rate when heating is not required. It will reduce by several hundred the seasonal meter closes and turn-ons required each year.

Southern California Gas Co. reports several changes in methods that have proved effective. They are the following:

Servel Door Gasket and Oven Door Spring Installation. It was decided to prepare a Job Instruction Training breakdown of Servel gasket and oven door spring installations. Many photographs of spring installations were taken at various stages as the oven was dismantled. These photographs were printed and copies attached to the breakdown for a particular range. They have proved valuable aids to men in the field as well as for training purposes.

Appliance Items. Certain appliance items most frequently requested in the field are carried as saleable stock on all service trucks. Examples of the number of sales from truck stock during 1950 are:

Item	*Number Sold*
½-in. hose cocks	12,000
Various oven door and valve handles	37,000
Floor furnace keys	3,000
Servel burners	2,100
Furnace pilot assemblies	7,000
	61,100

This procedure has resulted in reducing callback orders and eliminating many parts orders. Customer acceptance has been excellent because of the immediate service rendered.

Fig. 16

By_____ Date_____ Time_____

YOUR REPRESENTATIVE MAY CHANGE MY GAS METER ON:

Mon. Tues. Wed Thurs. Fri.

Date _____ _____ _____ _____ _____

I will be on the premises or admittance can be obtained by calling at* _____

*(within two blocks)

Name _____

Address _____

IMPORTANT NOTICE

The rules and regulations governing our operation as a public utility require that we change your gas meter periodically. To do this it is necessary for us to enter the house.

OUR SERVICEMAN CALLED TODAY TO CHANGE YOUR METER BUT FOUND NO ONE HOME. Will you please indicate on the attached card when we will be able to gain admittance *(allow at least five days from your mailing date)* or you may phone and arrange a convenient date.

SOUTHERN CALIFORNIA GAS COMPANY

Lubricating Valves. After considerable research by its laboratory, this company now approves the lubrication of valves by oiling. This method is used extensively both for valves on automatic controls, such as oven thermostats, and other manual valves, particularly where disassembly is difficult. Shell handy oil is the lubricant generally used, and it has proved very effective.

Periodic Meter Change Form. A special form for periodic meter change orders when the customer cannot be found at home is shown in *Fig. 16.* This form includes an addressed, postpaid business reply card that requires little of the customer's time for filling in and mailing. Arrangements are thereby made to have the meter changed on a given day. This form has materially reduced the calls necessary to change meters serving customers who are seldom home during regular working hours.

Repairing Leaks in Combination Meter and Regulator Unit. San Diego Gas & Electric Co. has submitted an item that may be of interest to companies that have used a combination meter and regulator unit. With thousands of these

INSTRUCTION SHEET
COMBINATION METER — REGULATOR UNIT

METERMEN:

Quite a number of combination meters are being changed in the field because of gas leaking through the regulator vent.

This condition is caused by the leather diaphragm being dry, allowing gas to seep through the pores of the leather and out through the vent opening.

This situation can be corrected very easily by Customer Service men in the field by following the simple directions indicated below:

1. Shut off service riser stop cock.

2. Remove the four screws which secure the regulator dome to the meter top casting.

3. Lift off dome and regulator adjusting spring.

4. Apply castor oil to the exposed upper surface of the regulator diaphragm with a 1-in. paint brush.

5. Replace adjusting spring, dome, and the four dome screws.

6. Turn on gas and check vent and dome flange for leakage.

NOTE

Change the meter if:

1. The above procedure does not stop leakage.

2. If after removing dome, there appears to be a hole or break in the diaphragm.

Fig. 17

units installed, many with leather diaphragms, "leak at meter" complaints very often are found to be gas seepage through dried-out leather diaphragms. The instruction sheet shown in *Fig. 17* outlines the method of handling this problem without changing the meter.

Manifold Marking or Houseline Badging. Southern California Gas Co. reports a new method of identifying the premises served by meters installed on meter manifolds. The company makes up an aluminum houseline tag *(Fig. 18)* on which the house or apartment number can be inscribed with a reamer. In 1950, 44,000 of these were used.

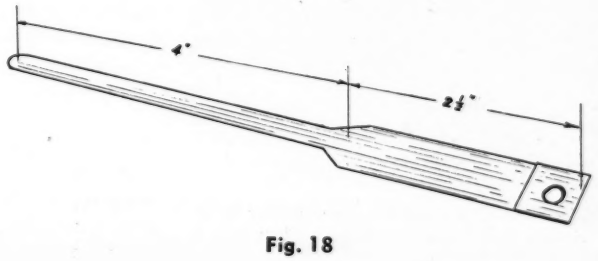


Fig. 18

On-the spot inventions

Ingenuity Solves Manpower Shortage on Pipe Service Job

SEMI-MECHANIZATION of a hand-labor pipe installation, made possible by the development of three simple gadgets, saved manpower and sped construction for Colorado Interstate Gas Co., Colorado Springs, on a recent job in the Denver area.

Short several men for a servicing operation on 6800 ft of 4-in. pipe and 2535 ft of 2-in. pipe, the CIG crews invented, on the spot, a cleaning machine, primer, and hot dope machine that enabled them to alternate manpower from one operation to another.

The job was too small for modern pipeline machinery. The bevel cleaning, line-up, and skidding by hand for welding required seven men. Stringing skids, cleaning, priming, hot dope application, lowering-in, back-filling, and some right-of-way clearing that would have ordinarily required six men was accomplished with four.

The cleaning machine *(Fig. 1)* was fashioned from a 15-in. length of 10-in. pipe, cut longitudinally and fastened on one side with two hinges, on the opposite side with adjustable bolts. Six lengths of 1-in. half-circle iron strips were welded inside, three to each half, spaced so that a regular cleaning brush would fit between. The strips prevented slippage and permitted two rows of eight brushes each to be fitted inside the 10-in. pipe.

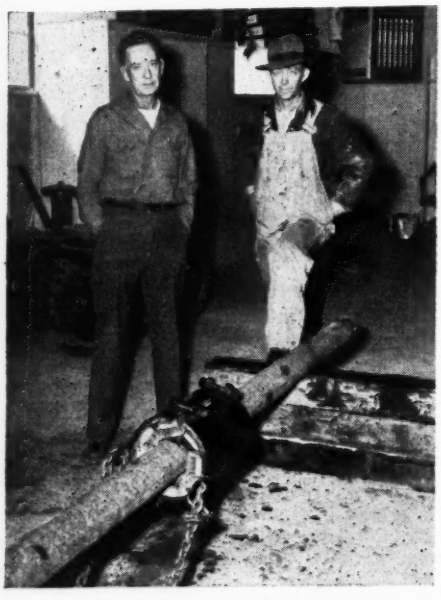


Fig. 1. Cleaning machine invented by H. C. Mollohan (left) mounts cleaning brushes, is propelled by tractor.

The machine was clamped on the 4-in. pipe and the bolts adjusted for proper tension. A tractor pulling a regular pipe cradle, fastened to the cleaner by means of a chain, provided propulsion.

Two men cleaned 1500 ft of pipe in 35 minutes, a task that would ordinarily have required the services of five men for 2½ hours, according to inventor H. C. Mollohan, Denver district foreman, who originated the idea.

The priming machine *(Fig. 2)* was cut from a 6-in. pipe in a manner similar to that used in making the cleaner. Instead of brushes and strips, a piece of rug was secured to the inside surface. It was propelled by two men using handles welded to each side of it. A quarter-turn rotating movement assured even spreading of the primer.

Fig. 2. Priming machine is equipped with handles for rotating through quarter turn as it moves along pipe. Workman at left pours primer.

With one man pouring the paint, 1500 ft of pipe were covered in 30 minutes. It was concluded that one man's time might have been saved by mounting a prime tank right on the machine.

A hand operation would have required five men working 2½ hours.

The hot-dope machine *(Fig. 3)* was developed by William J. Lynch, foreman at Devine. This device consisted of a 2-in. pipe attached to the outlet on a three-barrel paint pot, running at right angles to it, with a length of flexible tubing connected on the end. A pouring spout was fashioned on the outlet end of the tubing, with a handle attached.

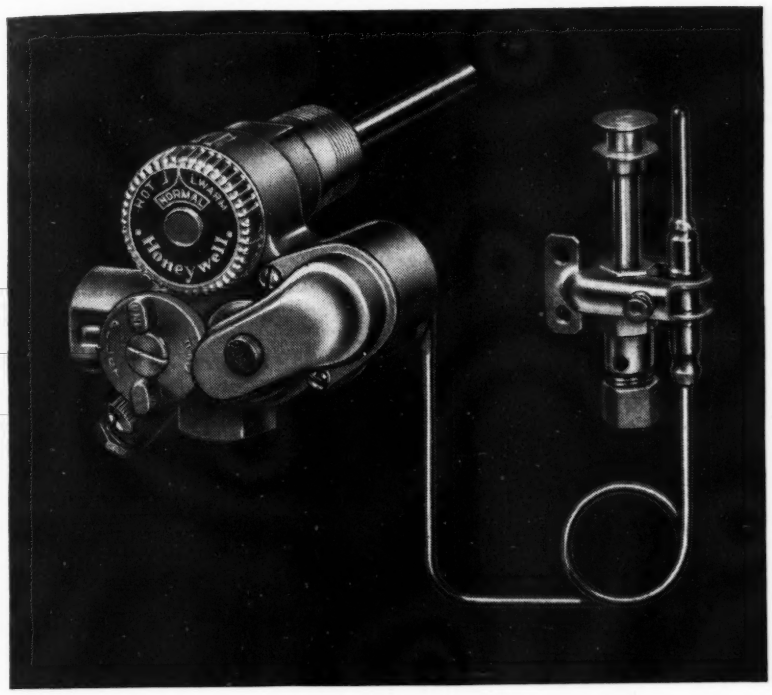
Six men manned this gadget, several being shifted from other jobs which had been completed. Fifteen hundred feet of pipe were covered in one hour; one man poured, another operated the tractor, two men handled the granny rag to spread the dope evenly on the under side, one removed skids, one checked for holidays.

Fig. 3. Hot dope machine includes the flexible tubing shown here which delivers the dope to the pipe ahead of the two men with the granny rag. Long handle shown is used to guide pouring spout over pipe.

A break in the flexible tube at the point of bend was remedied by the use of a 90°, 2-in. ell welded on the end.

Safe operation was an added advantage of the use of the three devices.

Adapted, by permission, from an article by H. C. Mollohan in the April 1951 issue of *The Gasser*, employee publication of Colorado Interstate Gas Co.



Now! A Wonderful New Gas Water Heater Control— from Honeywell!

That's mighty good news—as all of you who are familiar with the dependable, trouble-free operation of Honeywell's famous V5105 "Watertender" control for water heaters will recognize. For the *remarkable new V5119* gives you most of the advantages of the V5105—at a much *lower cost!*

It's just another of the many reasons why Honeywell is *First in Controls.*

This new combination control for water heaters incorporates in one unit a main gas cock, with pilot position, pilot adjustment screw, flow regulation valve, thermostat, and thermomagnetic pilot.

Send the coupon below today for detailed information on the new V5119 "Watertender."

MINNEAPOLIS **Honeywell**

Appliance Controls

APPLIANCE CONTROLS DIVISION
Minneapolis-Honeywell Regulator Co., Dept. GS-7-101
8775 Mettler St., Los Angeles 3, California
Send me detailed information on the new V5119 "Watertender" for water heaters.

*Name*_____

*Firm Name*_____

*Address*_____

*City*_____ *Zone*_____ *State*_____

No more chilly blasts

New Control Balances Heat Input in Forced Air Furnaces

A principal disadvantage of forced warm air heating systems, the frequent on-and-off operation of the blowers, can asertedly be eliminated by a new device, the "TempAirTrol," developed by El Roy L. Payne, president of the E. L. Payne Heating Co. of Beverly Hills, Calif. and a pioneer in the gas heating business.

Exclusive

In essence, the TempAirTrol controls the heat output of the furnace, assuring the home owner of a nearly constant flow of heat at a volume sized to balance heat losses from the home, eliminating stratification and the frequent chilly blasts of air caused by frequent on-off periods. Its chief application is for operation of a furnace at the reduced level required during the warmer days that are prevalent during most of the heating season. This control is achieved by a bypass arrangement.

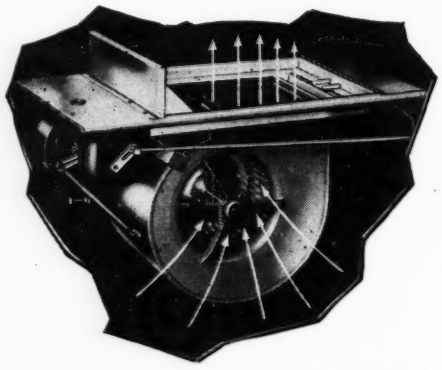


Fig. 1. Bypass damper closed, permitting delivery of full capacity of the blower over the heating surface.

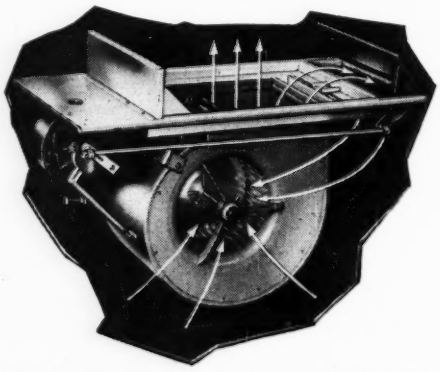


Fig. 2. Bypass damper open, reducing circulation of warm air through the home.

Valve for Gravity Flow

A valve was introduced some time ago by Mr. Payne for the purpose of balancing heat input to radiation losses in gravity flow furnaces, but no comparable device had been developed for general application to domestic forced warm air units.

The valve, electrically operated by a push-button on the wall, was equipped with orifices that provided three burner settings, a full-on, a 65% output, and a 35% setting. With this device, the furnace could first be turned on full, then turned to one of the other two settings, the choice depending upon how cold the day might be. This arrangement made for an evenness of temperature, with a constant flow of warm air circulating steadily through the rooms.

When used with forced air furnaces, however, the device created several problems. When the heat input is reduced without a similar reduction in the flow of air over the heating element, the result is that air leaves the blower at a temperature that may be lower than comfort demands. Furthermore, since the American Gas Assn.'s approval requirements specify that furnaces must maintain fixed low limits of temperature on the heating element, such reduction of air flow as would maintain these minimums is needed.

A second solution, the use of two-stage motors, has similarly fallen short of attaining the objective and has been expensive and complicated, according to Mr. Payne.

The TempAirTrol embodies three electric controls of types not generally used in domestic heating installations. The first is a two-stage thermostat, the second a two-stage magnetic gas valve, the third a motor damper. Its operation is fully automatic, the thermostat doing all the "furnace tending" needed. When started from a cold condition, the thermostat calls for full input of the furnace, causing the high side of the two-stage valve to turn gas on at full capacity. At the same time the low voltage damper motor is energized, closing off the bypass opening between blower and heating unit, permitting delivery of the full capacity of the blower over the heating surface and into the home. *Fig. 1* shows the position of the damper during this phase.

When the temperature reaches the thermostat setting, high contact on the thermostat is broken, which in turn breaks the circuit to the high side of the two-stage gas valve. This reduces the gas input to a predetermined low setting of the valve, simultaneously breaking the circuit to the low-voltage damper motor and permitting it to return to its normal, or open, position. This opens the bypass damper between blower and heat exchanger compartment, as shown in *Fig. 2.*

Damper Adjustable

The relief damper is adjustable by linkage to open at any position required by setting of the low-stage gas valve, and to maintain static pressure. This assures delivery of a uniform temperature of air at approximately 50% reduced velocity, while approximately the same vent temperatures are maintained in order to prevent spillage at the draft diverter, as are the element temperatures, both maximum and minimum, in order that compliance with AGA requirements will be achieved.

In the event the low stage setting of the gas valve delivers too much heat, because of lowered heat loss on warmer days, the thermostat will shut the burners off for a short time. Since the low setting is still operative, when heat is again called for the burners will come on at the low input rate and air delivery will be low, avoiding the sudden blasts of chill air. However, should the low flame be insufficient to maintain the temperature, the full flame will come on again automatically until heat balance is attained, after which the unit will once more revert to the low setting.

Thus a nearly constant flow of heat at a volume sized to balance heat loss avoids stratification and cold drafts and maintains static pressure.

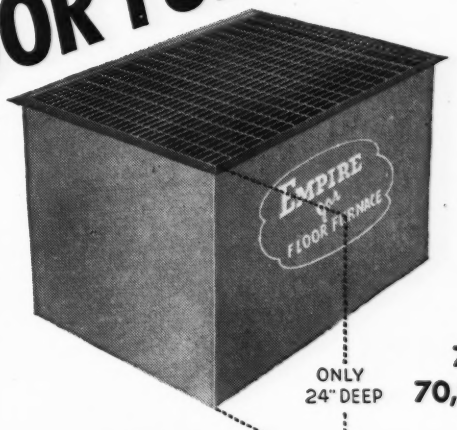
According to Mr. Payne, tests of TempAirTrol have demonstrated that floor - to - ceiling temperature differentials can be reduced by more than 50% and cycling of valves, motors, and controls through on-off operation can be reduced by 90%, lengthening the life of moving parts.

Zone Control

WITH

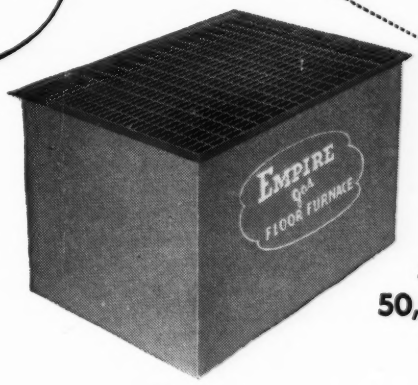
EMPIRE GAS FLOOR FURNACES

NO INTERNAL *Baffles* TO BURN OUT

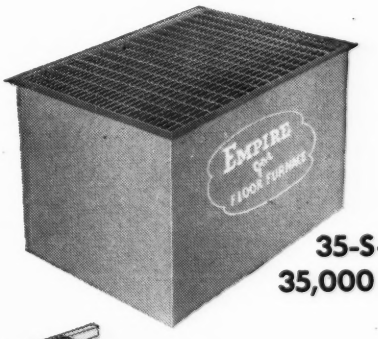


ONLY 24" DEEP

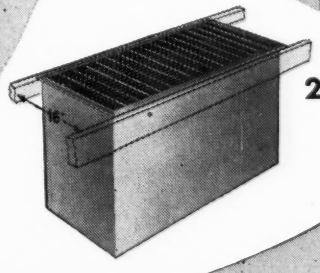
70-S-1
70,000 BTU



50-S-1
50,000 BTU



35-S-1
35,000 BTU



25-S-1
25,000 BTU

THE *Latest* IN MODERN GAS HEATING

Your customers will enjoy more comfort and lower operating costs when provided with a flexible heating system, enabling them to have different temperatures in the various sections of their homes.

An inexpensive, yet a highly satisfactory Zone Control Installation, can be accomplished by installing two or more Empire Floor Furnaces, individually controlled with Automatic Temperature Controls. Temperatures can then be controlled in the zone or section of the home in which each furnace is installed.

AGA APPROVED

EXCLUSIVE WITH EMPIRE

the FAMOUS

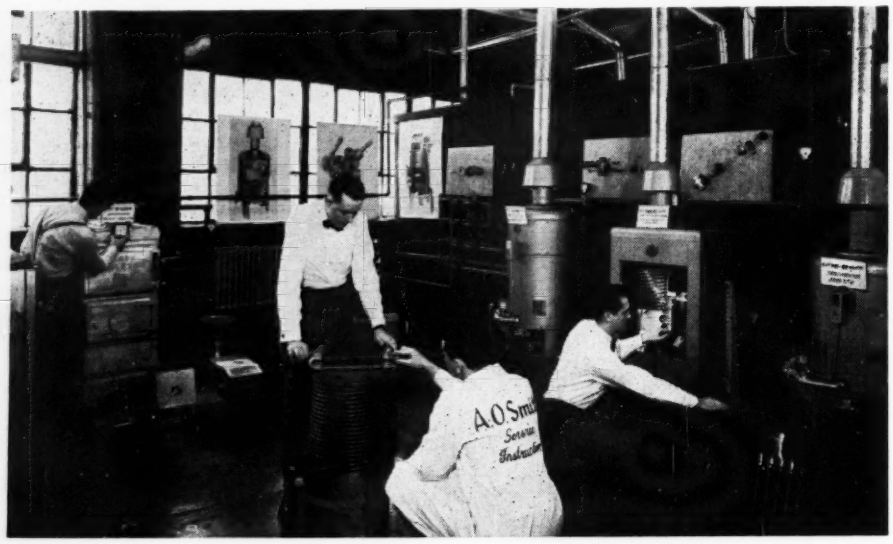
Gas BURNER

IT'S ENGINEERED, NOT ADAPTED FOR THE AVAILABLE GAS SUPPLY

EMPIRE STOVE CO. BELLEVILLE, ILL.

World's largest manufacturers of Floor Furnaces

NEWS



NEWEST ADDITION to A. O. Smith Corp.'s (Milwaukee) four laboratories and classroom is a heating equipment room containing working installations of various models of A. O. Smith heating equipment, as well as examples of typical heat radiation—such as hot water baseboard, standing floor convector, and radiant tubing, all piped for connection to any piece of Smith equipment. The new facilities are part of the company's monthly water heating equipment training clinics held at its Chicago product service branch.

Sales and Promotion

Range, Water Heater Shipments Lag Behind 1950

The effects of extra-heavy turn-of-the-year production and the peculiar 1951 appliance market were reflected for the first time in May, when shipments of gas-fired water heaters and ranges finally showed a drop from 1950's records. GAMA's statistical department, totting up the month's business, found that water heater shipments had slipped 13.5% while gas range shipments were taking a 28.9% dive.

The net result for the five months of 1951 found both appliances holding a fairly substantial margin over last year's period, however. The 1951 aggregate of 1,226,700 ranges was a solid 9.5% ahead of 1950's 1,119,900; water heaters shipments totaling 1,040,200 were 24.9% ahead of last year's 832,500.

The month's showings were, for water heaters 168,800, down from May 1950's 195,200, and for ranges, 172,700, down from 242,800. The comparison with April 1951 was also disheartening: movements of ranges dropped 77,000, of water heaters 40,000. This trend ran current to the 1950 pattern, when respective gains of 4000 and 19,000 over April were recorded in May.

Electric appliance shipments for the first four months appeared to be running in a similar groove. Water heater shipments were up in April over 1950's April by 19.8%, while range shipments for the same month had anticipated the May trend by skidding 7.7%. Through April, gas to-electric ratios were steady on 2.3 to 1 for water heaters, 1.8 to 1 for ranges.

GAMA's reports on electric appliance shipments always lag those on gas appliances by a month.

GAMA also released to members a new study tabulating shipments of boilers, furnaces, and conversion burners for a 15-year period from 1936 through 1950. A comparison of totals showed a growth in annual furnace shipments from 21,000 to 597,700; in boiler shipments from 11,100 to 76,500; of conversion burners from 38,400 to 345,300.

This study followed by two months the release of similar studies for ranges (from 1930 to 1950) and water heaters.

Pittsburgh Paper Publicizes "Miss Home Service"

The many activities of Manufacturers Light & Heat Co.'s home service department were well publicized in a recent two-page spread in the Pittsburgh *Press* roto section.

"Meet Miss Home Service—in this case, Mildred Naser" was the lead for the picture story, which showed a few of the many tasks she performs as a part of the constantly expanding field of activity of the Pittsburgh utility's home service department. Conducting brides', girl scouts', and business girls' cooking classes, giving advice to architects, making home calls, and teaching dealers and their salesmen to cook were shown as part of Miss Naser's day's work.

The story, developed with Miss Flora Dowler, home service director of the Pittsburgh Group of the Columbia Gas System, was circulated among the 499,000 readers of the Sunday *Press*.

Better Copy Contest Awards 143 Prizes

Winners in the Public Utilities Advertising Assn. Better Copy Contest for 1951 were announced late in May following the association's 30th annual convention at New York City's Hotel New Yorker. One hundred forty-three prizes were awarded in 22 classifications in the 28th running of the contest.

Gas companies and combination utilities carried away a fat share of the honors. Kansas Power & Light Co., Topeka, led the parade with eight awards, including three firsts and three seconds. Portland (Ore.) Gas & Coke Co. (with three firsts), Consolidated Edison of New York, and Cincinnati Gas & Electric Co. (also with three

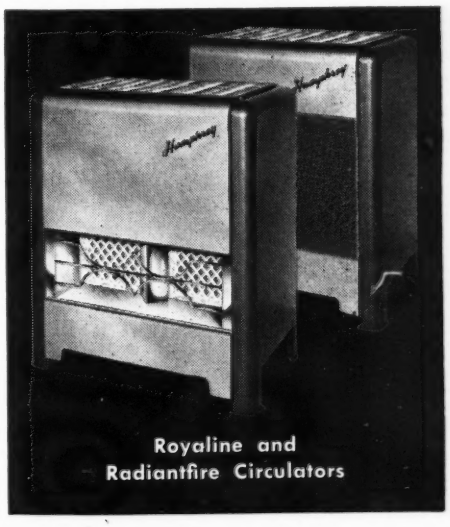
JACK HARTLEY, manager of TV station WEWS in Cleveland, Ethel Jackson, star of "Women's Window" program, and Harold Eckes, director of advertising for East Ohio Gas Co., which sponsors the show, look over a week's batch of fan mail. East Ohio, in the forefront among gas utilities in the use of television, won first award in this classification in the recent Public Utilities Advertising Assn. competition.

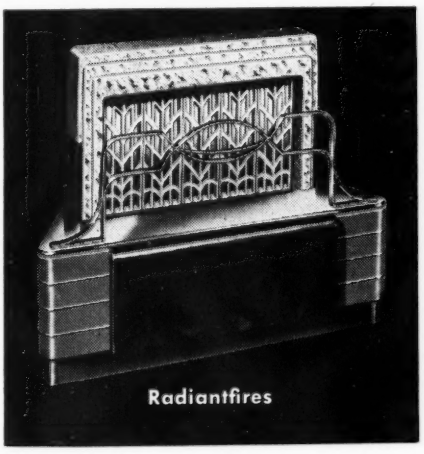
Humphrey GAS HEATERS...
UNSURPASSED FOR STYLE...ECONOMY...PERFORMANCE

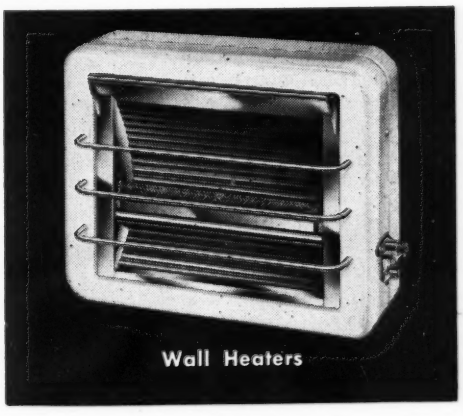
The dealer who sells Humphrey Gas Heating products earns dividends beyond his immediate profits.

By supplying his customers with Humphrey equipment, he gives them better styling, superior heating performance, and more economical service. Thus the dealer builds himself a fund of customer satisfaction which pays off in future sales.

Humphrey Gas Heating equipment is backed by a 50-year tradition of quality. Because this company has been building gas heating equipment *exclusively* for more than half a century, you can sell Humphrey products with confidence that there is no finer equipment made.







GENERAL GAS LIGHT CO. • KALAMAZOO, MICHIGAN

23 Warren Street, New York City • 2nd Unit Santa Fe Building, Dallas • 225 Eleventh Street, San Francisco

firsts) won five awards each for the runner-up spots.

First awards in exclusively gas advertising and promotion activity went to Boston Consolidated, Brooklyn Union, and Philadelphia Gas Works, for advertisement selling gas merchandise; East Ohio Gas Co., Cleveland, television; Laclede Gas Co., St. Louis, advertisement promoting the use of gas, and car and bus cards and truck posters; Peoples Gas, Chicago, employee magazines; Peoples Natural, Pittsburgh, window displays; Portland Gas, advertisement promoting the use of gas, special literature sent to employees, and car and bus cards and truck posters; Southern Counties, Los Angeles, advertisement promoting the use of gas; Texas Gas Transmission, Owensboro, Ky., in the motion pictures class.

A special citation went to Potomac Electric Co., Hagerstown, Md., for its cartoon ad, "Ten Little Free Workers," showing the dangers of creeping socialism.

Gas Hogs Contest Honors

Gas shared the honors with 45 commercial establishments when *Institutions* magazine announced the results of its fifth annual food service contest recently. Thirty-seven of a total of 45 winning installations were gas-fired.

Heavy duty gas cooking equipment won four of the five first awards, 16 of 20 merit awards, and 17 of 20 honor awards.

Restaurants, hospitals, schools, hotels and industrial cafeterias participated in the competition. Awards were made at the National Restaurant Show.

Manufacturers

Furnace Builder Sets Up Utility Sales-Service Unit

In recognition of the ever-increasing importance of gas utilities in the home heating field, The Coleman Co. Inc., Wichita, Kan., has established a special gas utilities section within its sales and service organization.

A field staff of three and a policy review board of five sales executives has been appointed to handle utility relations.

Continuing, careful attention to the problems and policies of the individual utility company will aid the manufacturer in designing and developing the right kind of heating equipment, President Sheldon Coleman believes. The company also intends to gain a better understanding of utility merchandising and servicing problems.

Included in the program are sales and service meetings for utility personnel and special schools for gas company representatives.

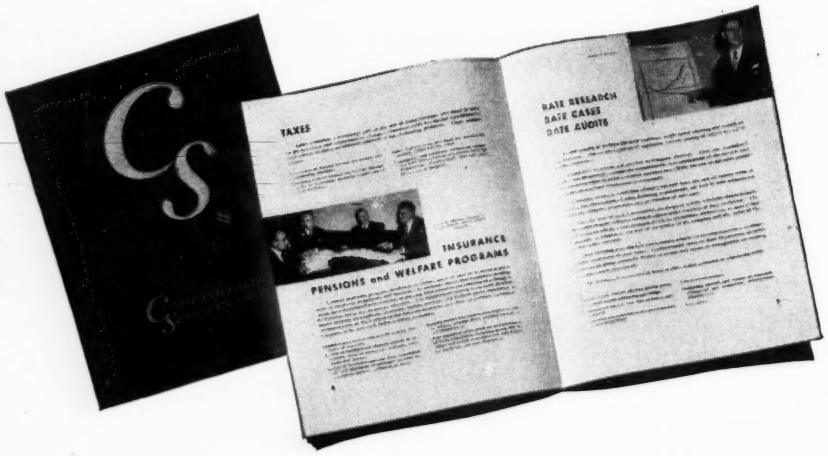
Robertshaw Lab Moves

Facilities of the west coast research and development laboratory of Robertshaw-Fulton Controls Co. have been moved to the first 12,000 sq ft building at the site of the new 1-acre tract near the Los Angeles International Airport.

Basic research, as well as the development of all types of controls and related devices, are provided for in the layout, which also includes a model shop, centrally located library, and a modern test kitchen. Divisions of the laboratory have been grouped in separate locations.

H. W. Geyer, recently appointed director, has added personnel to his staff to handle increased research activity.

THE TOUGHER THE JOB
THE MORE WE CAN HELP



An outside viewpoint is often essential in a search for new ways of cost reduction, methods, management, organizational, or engineering problems.

Commonwealth specialists have a sound background in the various aspects of business operations. Valuable time of your executives may be saved by calling Commonwealth in on the job.

No matter whether the job is large or small, Commonwealth's ability may profit you.

Check the ways in which Commonwealth can contribute to the efficiency and economy of your organization. Write for booklet describing the many services available to you. Address: Commonwealth Services Inc., Department B3, 20 Pine Street, New York 5, N. Y.

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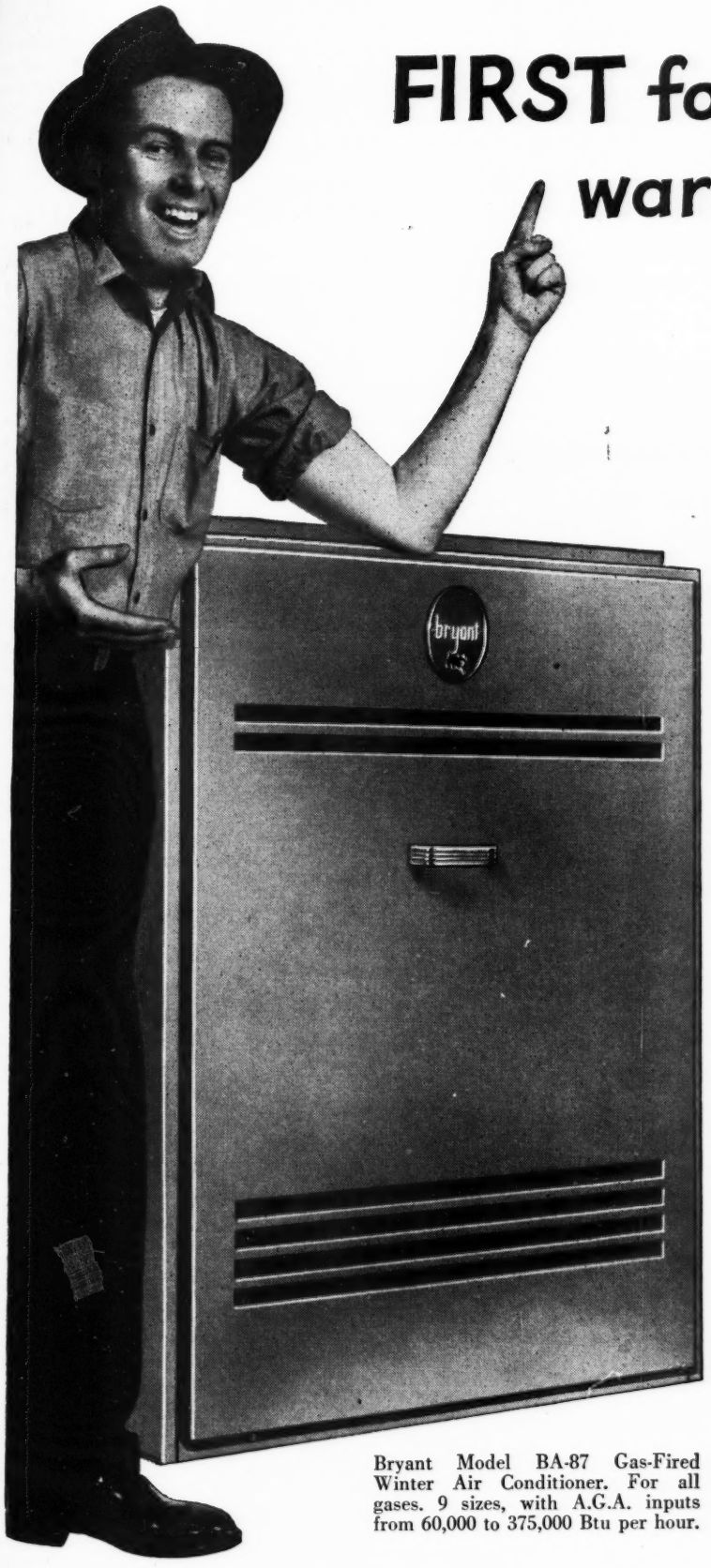
ABILITY • EXPERIENCE • RESOURCEFULNESS • RESULTS

TOP PERFORMERS at the 1951 Portland (Ore.) Home Show were entertainer Ann Bishop and this custom-made, built-in gas range which had its first Portland showing in the exhibit of Portland Gas & Coke Co. The show attracted 65,000 Oregonians.

FIRST for forced warm-air heating



Bryant Model BA-87 Gas-Fired Winter Air Conditioner. For all gases. 9 sizes, with A.G.A. inputs from 60,000 to 375,000 Btu per hour.

Here's one of the stars of the heating industry! Feature for feature, this Bryant Gas-Fired Forced Warm-Air Furnace offers advantages of design, construction and performance that are unsurpassed in any other warm-air unit.

Take its rugged *Hevigage* 12-gauge steel heat exchanger . . . almost three times as thick as the minimum required by A.G.A. and designed to provide the most rapid and efficient heat transfer. Take the brilliantly engineered Bryant Automatic Pilot and Controls, with their long record for reliability and gas-thrifty operation.

Run down the complete list of Bryant features in this popular unit and you'll decide it's the one you can count on for trouble-free performance on your lines and customer satisfaction!

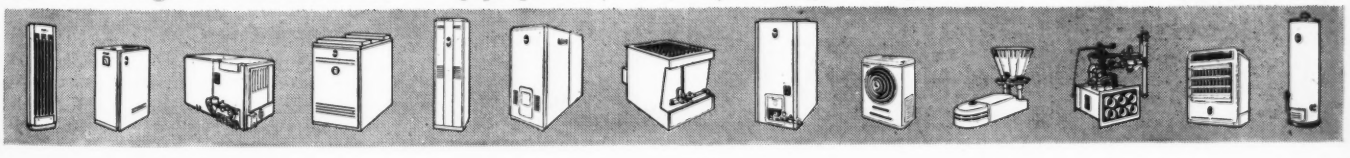
The Bryant Distributor near you will welcome an opportunity to tell you the whole story. Contact him today. Or write direct to Bryant Heater Division, Dept. 286, Affiliated Gas Equipment, Inc., 1725 St. Clair Avenue, Cleveland 10, Ohio.

Let the pup be furnace man ... and water boy too!

bryant

AUTOMATIC HEATING

Your *single source* of supply for everything in gas heating equipment!



Financial

FPC Suspends Rate Boosts For Two Pipeline Firms

Suspension of proposed increases in wholesale natural gas rates by Natural Gas Pipeline Co. of America and El Paso Natural Gas Co. were ordered last month by FPC. Based on the calendar year 1952, additions to revenue of $2.4 million, or 10%, and $7.1 million, or 11%, were anticipated for the respective companies.

Both dockets were to be taken up again at hearings to be set by subsequent order. In both cases FPC declared the proposed increases "may be unjust, unreasonable, unduly discriminatory or preferential . . ."

Sixteen customers of Natural Gas Pipeline serving communities in Iowa, Illinois, Kansas, Nebraska, and Wisconsin would be affected by the increases. In response to requests for comment, 12 customers and one state commission expressed no objection to the proposal.

The company told FPC it needed the extra revenue to cover purchase of higher priced gas from Texas Illinois Natural Gas Pipe Line Co.

Twenty-six customers along El Paso's system in Arizona, California, New Mexico, and Texas would be affected by the Texas company's proposal, which was to become effective June 1. This is in addition to a proposed $2,465,000 boost now pending before the commission, which was suspended in April 1950 but allowed to take effect Oct. 1 last year under a provision of the Natural Gas Act. El Paso has a bond posted to cover this increase in case a refund is ordered.

Gas Revenue Up, Net Skids

The steady upward march in natural gas companies' operating revenues continued in March as a record $151,511,608, representing a 14.5% increase over the same month a year ago, was set by companies reporting to the Federal Power Commission.

FPC's compilation, released last month, showed a less impressive (4.5%) increase in operating income and a drop in net income of more than $300,000. Operating deductions showed a substantial rise, totaling 17%; behind this figure were boosts of 11.6% and 16.4% respectively in the categories of operating expenses and depreciation, while taxes accounted for an increased bite of 44.7%.

Gas sales hit 210,469 MMcf, up 11.5%, with industrial gains leading the field at 13.5%. Twelve months operating revenues were up 27% to just under $1.4 billion, while net income was up 26.3% to $188 million for the period.

Sales Up Despite Weather

Gas sales in April 1951, as reported by the American Gas Assn., increased 16.7% over April 1950, despite a 13% decline in degree days.

During the 12 months ended April 30, utility sales rose 17% over the comparable period last year. Natural gas sales were up 19% for the month and 18.7% for the year ended in April.

Sales of manufactured and mixed gas declined for both April and the month ending April 30, down 7.1% and .1%, respectively.

Regulation

Virginia Utility Carries Heating Ban Plea to Court

A battle between a gas distributor and the Virginia State Corporation Commission over a space heating freeze order last month moved into the state supreme court's chambers and threatened to end up right in Washington.

Virginia Gas Distribution Corp., the retailing outlet for Virginia Gas Transmission Corp., a Columbia Gas System subsidiary, had asked for—and been granted—a temporary freeze on April 9. But when a new order had been sought on June 6, the state commission balked. Pressure was heavy from the cities of Waynesboro, Staunton, Buena Vista, and Covington, which Virginia Gas serves, where city officials want gas for space heating of new low-cost homes.

Virginia Gas, which has only enough gas for peak service to present customers, asked the court for a ruling. John W. Partridge, a company official, said that if he couldn't

WEBSTER Series F600 BURNER

FOR
LOW PRESSURE GAS

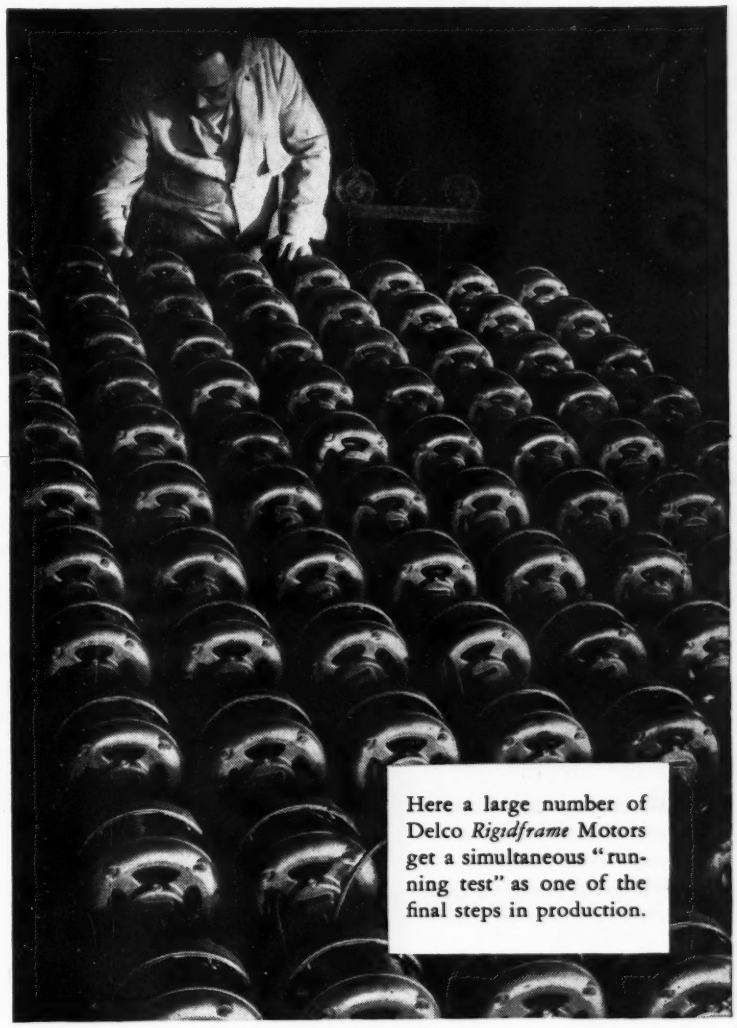
Designed for LOW GAS PRESSURE
INTERCHANGEABLE PORTS
RADIANT fire brick top
NO COMBUSTION CHAMBER required
WILL NOT VIBRATE
LOW draft loss
ANY SHAPE and SIZE
INTEGRALLY MOUNTED Pilots

*TRADEMARK

The WEBSTER ENGINEERING COMPANY
TULSA, OKLAHOMA
Division of SURFACE COMBUSTION CORPORATION, Toledo, Ohio

Good automatic heat depends on good motors

Delco-Heat makes its own blower motors right in the Rochester plant



Here a large number of Delco *Rigidframe* Motors get a simultaneous "running test" as one of the final steps in production.

The Delco Appliance Division of General Motors Corporation is one of the country's largest producers of electric motors. It is this fact that enables Delco Appliance to make rugged, dependable blower motors that are *specifically designed and built for Delco-Heat home heating equipment.*

The *Rigidframe* motor—an exclusive Delco Appliance production achievement—is the standard motor found on all Delco-Heat units. Featuring a welded-strut design that replaces bolting or riveting of stator laminations, the *Rigidframe* motor is a rugged, efficient, and quiet operating power unit that is built for years of service.

It is only natural that Delco-Heat engineers can design simpler and more efficient heating equipment, because they have such a large measure of control over the production of motors and other component parts.

And because Delco-Heat units are General Motors products, they are made by the world's greatest experts in mass-production techniques. Delco-Heat can offer units of top quality and unexcelled engineering features—at prices competitive with any in the industry. And Delco-Heat Retail Distributors, in turn, can offer their customers the very finest heating systems—at the lowest possible costs.

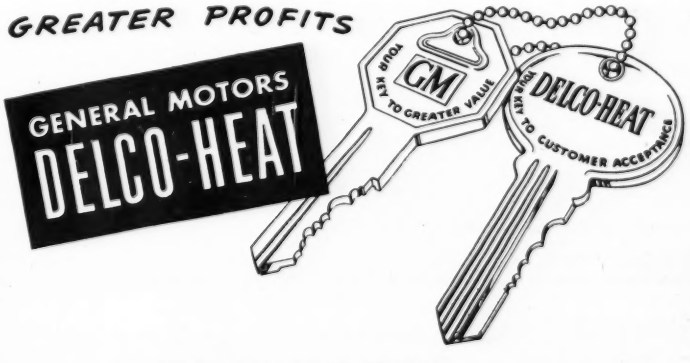
YOUR KEYS TO GREATER PROFITS

DELCO-HEAT GAS CONDITIONAIRS

Five models in capacities from 62,500 to 210,000 Btu Input

GA 63 GA 90 GA 120 GA 150 GA 210

Manufacturers of oil- and gas-fired automatic home heating equipment and of electric water systems for farms and homes beyond city water mains



DELCO APPLIANCE DIVISION

General Motors Corporation • Rochester 1, New York

get favorable action out of the state, he would press for a federal order to ban further space heating installations.

NPA's Revised Order Effects 30% Output Cut

The National Production Authority's revision of order M-47 went into effect this month, clipping production of most consumer durable goods for the third quarter to 70% of the base period rate.

The base period may now be established as either the last six months of 1949 or the first six months of 1950, at the manufacturer's discretion. This provision makes allowance for seasonal fluctuations in the manufacture of certain lines.

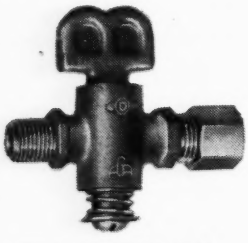
Several other changes were ordered under M-47, including the provision that manufacturers must fill defense rated orders from the 70% quota (although adjustment for hardship cases is provided); the exemption from the 70% limitation for small users (carbon steel products for whose total output during the third quarter no more than 5 tons of carbon steel is required, alloyed steel users who require less than 1000 lb); and the grouping of related items so as to permit a manufacturer to divert steel from the manufacture of one product to another.

VALVES
For The GAS
HEATING INDUSTRY

Main shut-off valve, No. 2,000
Sizes: ½", ¾", 1", 1¼", 1½".

For...Furnaces...Conversion Burners...All Heating Equipment

Pilot valve, No. 1920
⅛" x ¼" c.c.



Pilot valve, No. 1910
⅛" x ¼" c.c.

These are only two of the complete line of pilot valves currently being supplied to the industry.

Continued expansion of the Gas Heating Industry will be dependent in part on the maintenance of the present high level of customer satisfaction. That's where valves come in—valves that can be depended upon to withstand torque and abuse—valves that won't talk back to you through customer complaints—valves designed to assure satisfaction for the life of the equipment.

These are some of the advantages gained when "Detroit Brass" valves are specified. Detroit Brass Valves are produced from highest quality brass, strongly constructed and A. G. A. approved. Produced by a pioneer company in the gas valve field, they bring to the user the advantage of long experience in research, engineering and field testing. They spell satisfaction to you and your customers.

Gas Appliance Fittings produced by Detroit Brass & Malleable Works include a complete line of valves for ranges, water heaters, space heaters, furnaces and all other types of gas equipment.

GAS VALVE DIVISION
DETROIT BRASS & MALLEABLE WORKS
DETROIT 9, MICHIGAN

Miscellany

Utilities Score Gains In 1950 Safety Records

That safety programs in the gas industry are paying off was demonstrated in recently released reports from the AGA and the National Safety Council.

The 1950 record of 16.03 disabling injuries per million man hours was 11% lower than 1949's mark, although the industry moved up only one place—to 32nd—in the NSC's list of 40 industries. Nevertheless, the improvement in its own record was substantially better than the 40-industry average of 8%. For the previous year, a similar 11% gain had fallen short of the all-industry average of 12%.

All-industry injury rates for 1950 averaged 9.30 per million hours.

In severity, gas companies clipped 20% off the 1949 rate with a .79 figure for time-charges in days per 1000 man hours. This record moved the industry up from 22nd to 19th place in the standings, as the 40 industries established an average improvement of 8% for a .94 rating.

AGA's figures showed that the number of disabling injuries dropped from 3.70 per 100 employees to 3.33, a decline of 10%.

New York Cities Convert

Natural gas was turned on in Brooklyn on June 5 for 12,000 domestic and commercial customers of Kings County Lighting Co. By the end of July the gas will be available to the firm's 120,000 customers in Bay Ridge, Bensonhurst, Borough Park, Fort Hamilton, Bath Beach, and adjacent areas.

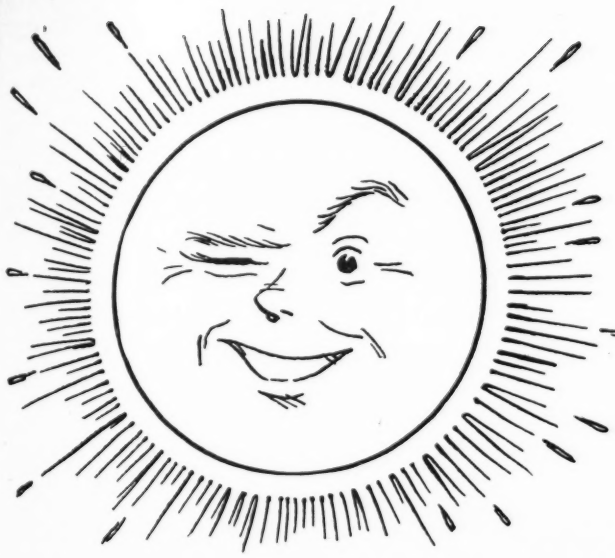
Cost of the conversion was $2.2 million. Conversion work now going on will bring natural to customers of Brooklyn Union Gas Co., Brooklyn Borough Gas Co., and Consolidated Edison Co. by fall.

Gas will soon be available to customers of Rochester (N. Y.) Gas & Electric Corp., too. The company has announced that it plans to change over about 13,000 homes in the Kodak Park area, Irondequoit, and Fairport. Conversion was to begin June 27 and to be completed in a month.

Flaring Hearing Begins

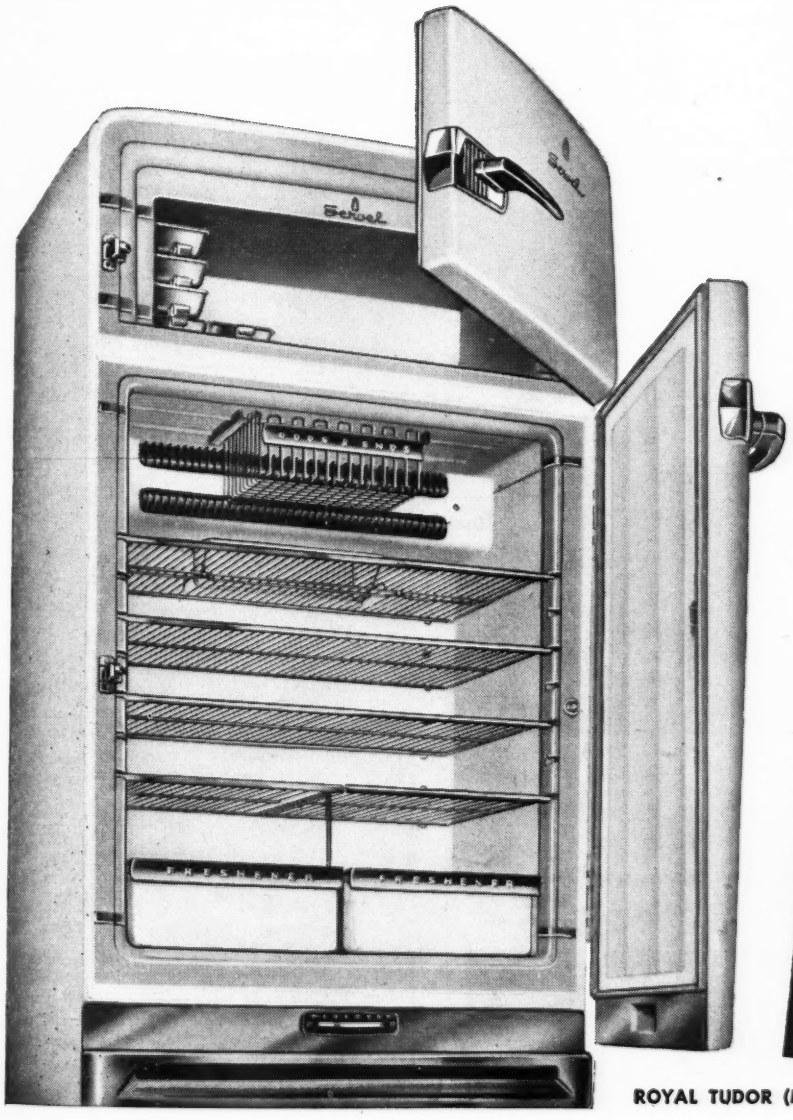
West Texas oilfield operators once more are flaring gas, so on June 13 "show cause" hearings were begun before the state railroad commission. A slowdown order is being considered by the commission to hold production of oil to a point where El Paso Natural Gas Co. could take all casinghead gas brought up.

Upwards of 35 MMcf per day are being flared throughout 11 counties. Three years ago, several of the fields now charged with flaring were ordered by the commission to shut down. While the commission was restrained by the courts from enforcing its order, operators installed equipment to save the gas.



Make this Summer your hottest Selling Season

Sell the Great New Servel



ROYAL TUDOR (Model BR-1118)

Hot weather will make warm friends and important sales for you this year with the spectacular new Servel. This incomparable refrigerator can really make sales history now, when summer heat and mechanical refrigerator breakdowns are making people replacement-minded. The new Servel is actually one-third bigger inside, yet needs no more space outside. And what's more, Servel's marvelous, motorless freezing system has a *10-full-year* warranty!

The magnificent Royal Tudor is truly the last word in modern refrigeration. Standard bearer of all eight new Servel models, it has a huge 11.5-cu.-ft. capacity . . . a separate 2-cu.-ft. freezer compartment and a 9½-cu.-ft. space for other foods. Homemakers will be sold by its feather-touch Bulldog Latches that click themselves shut . . . twin Dew-Action Vegetable Fresheners, glass-covered for easy visibility. Quick-Change shelves solve the problem of large bulky-food storage.

With the Royal Tudor and the other seven marvelous new Servels, you have a model for any size kitchen, any size family. So take advantage of the wide-open summer market to sell the world's finest refrigerator—the matchless new Servel. For suggestions write Servel, Inc., Dept. H-17, Evansville 20, Indiana.

STAYS SILENT . . . LASTS LONGER

Servel

The GAS Refrigerator

News In Brief

Equitable Gas Co.'s (Pittsburgh) purchase of Bellewood & Monongahela City (Pa.) Natural Gas Co. for $468,000 has been approved by the state public utility commission. Equitable thus gains 4000 customers in Washington county.

Early last month a Michigan law prohibiting strikes by public utility employees was upheld in a lower court, clearing the way for a Supreme Court test case of the act which has complicated negotiations in the Detroit transit strike. Circuit Judge Ira Jayne dismissed a suit brought by Atty. Irwin Cohn asking the law be set aside so bargaining on wages and other issues could proceed.

On May 24 Servel Inc., Evansville, Ind., announced its first curtailment in household refrigerator production since the Korean war began. NPA limitations on use of steel, aluminum, and other critical materials for the second quarter were cited as the reason for the cutback.

A. O. Smith Corp. recently chalked up two impressive sales in Texas. The first was the delivery of the 100,000th LP-Gas system to be brought off its Houston works lines since production started in 1945. Butane Supplies Inc. of Tyler, Texas, was the recipient. In the domestic field, A. O. Smith's Dallas office negotiated the sale of 60 Smithway-Burkay hot water heaters for Camp Hood, where they will provide two-temperature hot water for use in mess halls.

The proposed excise tax on the transportation of natural gas died in the House Committee on Ways & Means late in May. A 4.5% tax recommended by the Joint Committee on Internal Revenue Taxation was considered.

Three new distributors added by Servel last month bring the total of new outlets established since Jan. 1 to 16. Emerson Radio of Washington Inc., Washington, D. C.; Tri-City Radio Supply Inc., Davenport, Iowa, and Z. C. M. I. Wholesale Distributors, Salt Lake City, were appointed, the former two being designated as water heater and refrigerator representatives, the latter handling refrigerators.

Wholesale customers of Ohio Fuel Gas Co., Columbus, have received refunds totaling $1.3 million since April 13, FPC announced last month. On that date, the commission approved part of a rate increase previously effected by the company, but simultaneously ordered Ohio Fuel to rebate the difference between the rate allowed and that charged since April 1, 1950. Twenty-five customers collected from the company—at 6% interest.

A transfer of properties between two Columbia Gas System companies, Manufacturers Light & Heat Co. and Natural Gas Co. of West Virginia, has been approved by FPC. Manufacturers will pay $3.7 million for the acquisition, including natural gas wells in West Virginia and Pennsylvania, a gathering system, two small compressor stations, and three 8-in. and one 10-in. line. Both companies are members of Columbia's Pittsburgh Group.

Acquisition of the Ohlen-Bishop Manufacturing Co. of Columbus, Ohio, has increased the holdings of Rockwell Manufacturing Co., Pittsburgh, to a total of 17 divisions and subsidiaries. The Ohio firm manufactures a complete line of saws, and its operations will augment the production of power tools made by Rockwell's Delta Manufacturing Division.

A course on natural gas handling practices, to be ready in 1952, was announced at the midyear committee conference of American Petroleum Institute's division of production, held May 29 in Denver. The 30-hr course, which will be available to oil field workers throughout the U. S., is under preparation by the API vocational training subcommittee in cooperation with the University of Texas. Traveling instructors will be employed.

Because it believes a well informed employee is a good employee, Northern Natural Gas Co., Omaha, has issued to all its workers billfold cards containing a great deal of statistical data about the company and its operations. The cards were included in the May issue of *Northern Natural News*, the firm's house organ.

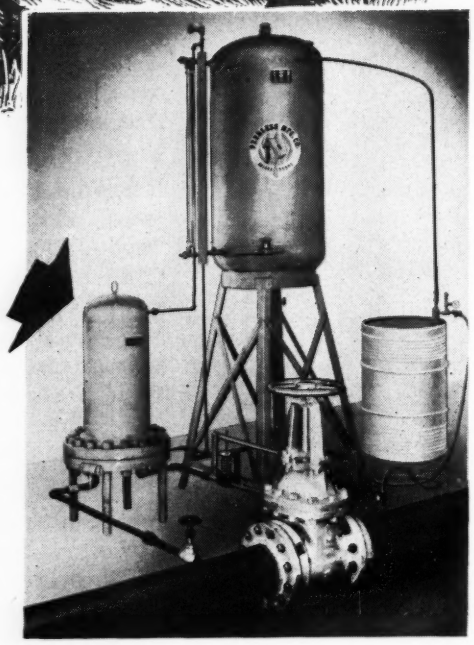
M. A. Abernathy, vice president of United Gas Corp., Shreveport, has been appointed to PAD's Gas Industry Advisory Council, replacing N. C. McGowen, president of United, according to an announcement of Secretary of the Interior Oscar L. Chapman.

PEERLESS
TYPE "M" ODORIZER
Proven Over 15 Years of Actual Use

Yes, hundreds of Peerless Odorizers are doing a big job all over the country. They are providing the most accurate and trouble-free odorization available.

Peerless Odorizers are designed to automatically maintain an accurate odorization rate during variations of flow, temperature, and pressure. They provide maximum efficiency with a minimum of maintenance.

Years of satisfactory service have established the Peerless Type M Odorizer as the leader.



A typical installation of a Peerless Type "M" Odorizer.

For Complete Information and Specifications Write Dept. G for Bulletin 901

PEERLESS MFG. CO. DALLAS, TEXAS

PEERLESS MANUFACTURING CO.
Walnut Hill Lane at Old Denton Road
P. O. Box 7193 DALLAS, TEXAS DI-8431

AGENTS IN: Hobbs, N. M., Houston, Odessa, Wichita Falls, Alice, and El Paso, Texas. Tulsa, Denver, Philadelphia, Phoenix, Los Angeles, Boston, Cleveland, New York City, Buffalo, Chicago, Richmond, Louisville.

ASSOCIATIONS

Venting Central Theme Of Research Conference

Importance of gas appliance venting to the gas industry was the chief topic discussed at a recent AGA Research and Utilization conference held in Cleveland under the auspices of the committee on domestic gas research and the utilization bureau.

Dr. Sam C. Hite, Purdue university, defined venting and discussed problems created by modern construction methods. C. E. Blome, Dallas, as a member of a panel on venting suggested a larger and more comprehensive venting research program sponsored by PAR, improved instructions from manufacturers of gas equipment on how to vent and install their products, more newspaper and trade paper articles, and modernization and strengthening of codes, as well as better enforcement of existing codes.

The contribution of automatic laundry appliances to the need for better understanding of venting was outlined by W. D. Egan, Peoples Gas Light & Coke Co., Chicago. He pointed out the steps his company is taking to insure better venting of clothes dryers.

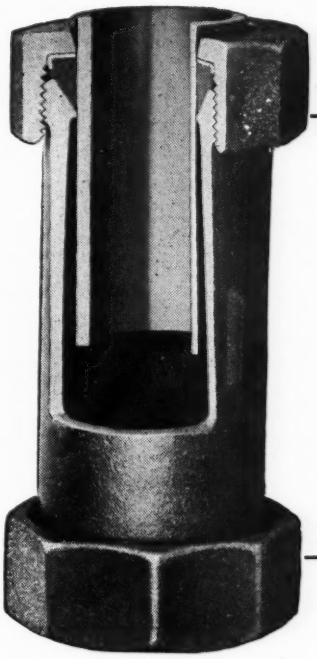
Personnel Session Planned

At a joint meeting of the AGA Midwest and Great Lakes personnel conferences held in Kansas City on June 8, the two groups agreed to cooperate with the association's personnel committee in sponsoring an industrial relations session at the 1951 AGA convention in October.

Harold F. Taylor, chairman of the Southern Gas Assn.'s employee relations group, reported that his group would probably join in sponsoring the session.

Some 60 gas company personnel executives attended the Kansas City meeting, pre-

THREE OF THE 26 lecturers who talked to the 123 enrollees at the AGA Industrial Gas School held the week of May 14 in Pittsburgh were C. E. Eeles, Toledo, and R. S. Wenner, Columbus, both of Ohio Fuel Gas Co., and Bud Koester, W. Wirt Young & Associates, Wellesley Hills, Mass. Students represented 55 member utilities, 17 manufacturers, and two service and research organizations.



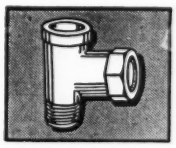
NORMAC

Couplings, Sleeves and Fittings

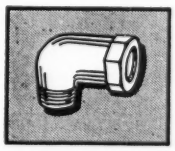
for maximum deflection, ease of "stabbing," complete confinement of the rubber!

So close are "Normac" rubbers confined at the gasket tip that possibility of flow is reduced almost to "nil." These couplings, sleeves and fittings . . . approved by gas utility men across the country for their time-saving features, ease of handling and dependable service . . . are available in a complete range of sizes. Made from air furnace malleable iron they provide greater wall thickness than pipe on which used.

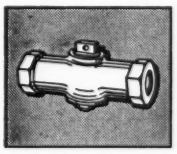
NORMAC COUPLINGS are made with 5" centers in all sizes. NORMAC SLEEVES are identical in design except that they are identical in design except that they are made with 10" centers. Nuts and gaskets are interchangeable.



Compression-End Service "Tee"—First fitting of this type ever produced with full coupling depth and special threads on male end to prevent dropping into old hand taps when used to replace standard threaded fittings.



Compression-End Service "Ell" — Extra depth makes it possible to "stab" pipe into stops and without measuring, pull back a safe distance to allow ultimate deflection eliminating possibility of strain against tap in main.



Compression-End Iron Body Brass Core Service Stopcocks—End the necessity of threading on the job plus the elimination of the threads themselves—combining all the advantages of NORMAC COUPLINGS and the best in stopcock design. 2½" coupling depth on each end.

Normac Brass Fittings Developed in 1939 for Use with Copper Tubing—Our complete line of brass fittings can be used either on new installations or where copper is run through old steel pipe in large or small openings. The center to end dimensions of NORMAC TEES correspond with old malleable iron fittings. This feature is extremely important in the use of these fittings in one foot openings where the tubing must line up with the steel which has been removed.

Write for the NORMAC CATALOG of Gas Distribution Equipment

NORTON-McMURRAY MFG. CO.

122 SOUTH MICHIGAN AVENUE - - - CHICAGO 3, ILLINOIS

Couplings • Meter Bars • Sleeves • Cocks • Bell Joint Clamps • Service Tees & Ells

sided over by J. T. Innis, Northern Natural Gas Co., chairman of the Midwest group. Speakers included Dwight S. Sargent, Consolidated Edison Co. of New York; Norman D. Bradley, East Ohio Gas Co.; Kurwin R. Boyes, AGA secretary; and Mr. Taylor, Oklahoma Natural Gas Co.

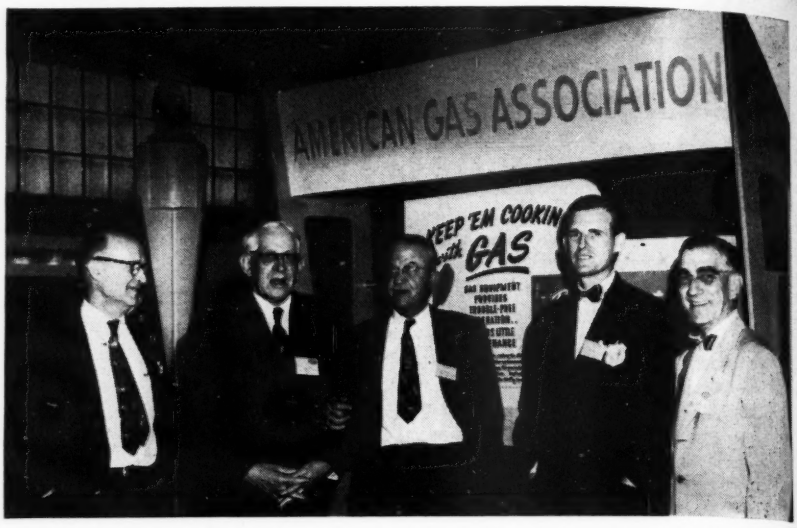
Selling Under Handicaps Explained at Regional Meet

Means of promoting and selling gas and gas appliances, despite credit limitations, higher taxes, and conversion to defense production, were presented at the New York-New Jersey Regional Sales conference held June 18-19 at Asbury Park, N. J. The annual gathering is sponsored by the AGA residential gas section.

The program was arranged by W. D. Williams, Public Service Electric & Gas Co., chairman; and Robert N. Laux, Kings County Lighting Co.; Hugh L. Wathen, South Jersey Gas Co.; and Jack B. Frost, Brooklyn Union Gas Co.

Highlights of GAMA's new program of promotion and public relations were discussed by Managing Director H. Leigh Whitelaw. Dealer relations problems as related to gas utility merchandising was the topic handled by Harold Zeamer, The Philadelphia Gas Works Co. Brooklyn Union's new business department presented "Rain or Shine," a skit on the advantages of the gas laundry dryer. "What About the Gas Cooking Load" was the title of an address by A. B. Ritzenthaler, Tappan Stove Co.

AGA's promotion plans, under PAR, were outlined by H. Vinton Potter. Conversion of manufactured and mixed gas territories to natural was the subject of a panel composed of Christy Payne Jr., Peoples Natural Gas Co.; R. D. McNeice, Public Service Electric & Gas; Roger Gordon, Washington Gas Light Co.; and Vernon Stanton, South Jersey Gas.

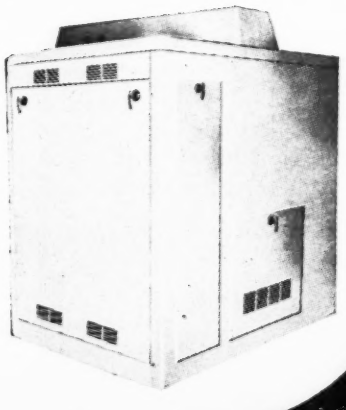


For the second year AGA's combined commercial gas exhibit at the National Restaurant Exposition in Chicago stretched the width of Navy Pier and attracted the attention of all who attended the show. Twenty exhibitors shared the 320-ft spotlighted display, with blue flames on pylons in the various booths.

Shown here in front of the AGA section are M. A. Combs, AGA; J. C. Pitman, Lynn, Mass.; F. X. Mettenet, Peoples Gas Light & Coke Co., Chicago; J. J. Condon, Peoples; and J. T. Heilig, Savory Equipment Inc., Newark.

Here's the Solution to Bottle Washing Solution Heating Problems

• The Evans Heating Unit is saving money, time and trouble every day in the year for bottlers throughout the nation! This good-looking, economical gas-fired unit makes obsolete the expensive, troublesome coal or oil-fired boiler in bottling plants. The Evans Unit AUTOMATICALLY maintains desired solution temperatures for bottle washing machines. You just light the gas and forget it! Gas sales representatives should write us for complete information.



G. C. EVANS SALES COMPANY
LITTLE ROCK, ARKANSAS

EVANS

• • • • • AUTOMATIC HEATING UNITS • • • • •

CALENDAR

JULY

American Society of Heating & Ventilating Engineers Semi-Annual Meeting—Portland, Ore., July 2-4.

SEPTEMBER

Pacific Coast Gas Assn. Annual Convention—Fairmont hotel, San Francisco, Sept. 4-6.

New Jersey Gas Assn. Annual Meeting—Monmouth hotel, Spring Lake, N. J., Sept. 7.

Mid-West Gas Assn. School and Conference—Iowa State College, Ames, Sept. 13-14.

Maryland Utilities Assn. Fall Conference—Virginia Beach, Va., Sept. 22-23.

Independent Natural Gas Assn. of America Annual Meeting — Skirvin hotel, Oklahoma City, Sept. 24.

American Society of Mechanical Engineers—Hotel Radisson, Minneapolis, Sept. 25-28.

OCTOBER

Texas Mid-Continent Oil & Gas Assn. Annual Meeting—Beaumont, Texas, Oct. 8-9.

39th National Safety Congress & Exposition of the National Safety Council—Chicago, Oct. 8-12.

AGA Annual Convention — St. Louis, Oct. 15-17.

National Metal Congress and Exposition—Detroit, Oct. 15-19.

National Assn. of Corrosion Engineers, South Central Region—Corpus Christi, Texas, Oct. 18-20.

NOVEMBER

Wisconsin Utilities Assn. Technical and Sales Convention—Schroeder hotel, Milwaukee, Nov. 14-16.

American Society of Mechanical Engineers—Chalfonte - Haddon Hall, Atlantic City, Nov. 25-30.

DECEMBER

Institute of Cooking and Heating Appliance Manufacturers Semi-Annual Meeting—Cincinnati, Dec. 3-5.

MARCH 1952

National Assn. of Corrosion Engineers—Galveston, week of March 10.

New England Gas Assn. — Hotel Statler, Boston, March 27-28.

Mid-West Gas Assn. Annual Meeting—Hotel Radisson, Minneapolis, March 31-April 2.

APRIL

National Conference of Electric and Gas Utility Accountants—Hotel Commodore, New York, April 7-9.

AGA Distribution, Motor Vehicles, and Corrosion Conference — Benjamin Franklin hotel, Philadelphia, April 7-10.

Southwestern Gas Measurement Short Course — University of Oklahoma, Norman, April 8-10.

Southern Gas Assn. Annual Convention—Galveston, April 21-23.

Mid-West Regional Gas Sales Conference—Edgewater Beach hotel, Chicago, April 28-30.

MAY

AGA Commercial Gas School — Chicago, May 5-9.

AGA Natural Gas Department Spring Meeting—Biltmore hotel, Los Angeles, May 12-13.

Gas Appliance Manufacturers Assn. Annual Meeting — The Broadmoor, Colorado Springs, May 21-23.

AGA Production and Chemical Conference—Hotel New Yorker, New York, May 26-28.

JUNE

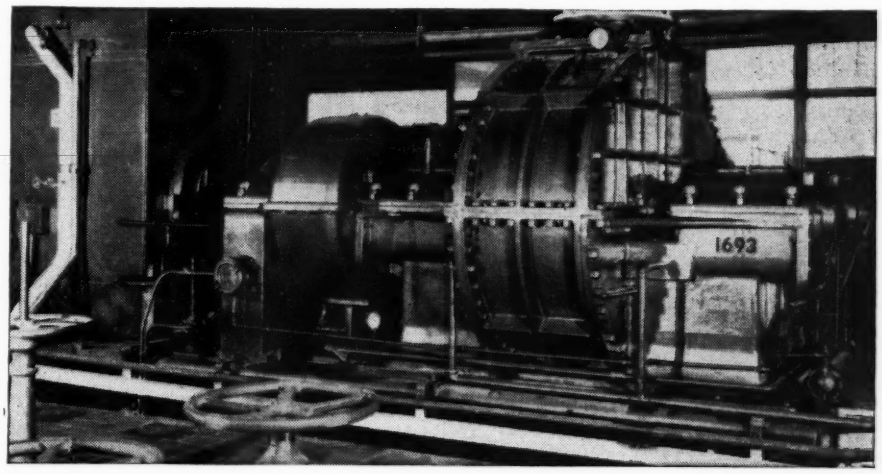
Canadian Gas Assn.—Chateau Frontenac Quebec City, Quebec, June 8-12.

NEW R·C EXHAUSTER
pays its own way

By replacing a 30-year-old battery of three steam-driven gas exhausters with a new, high-capacity, electrically-driven R-C unit, important advantages were gained, in a large industrial plant:

1. **The one new unit carries the base load.**
2. **Steam needed for 5 other steam-driven exhausters, carrying partial load, is substantially reduced because of slower speeds.**
3. **Heat balance in the plant is maintained.**
4. **Savings in total power cost will pay for the new installation in about one year.**

These very satisfactory results were obtained by careful evaluation of all the factors before deciding upon the type of equipment . . . and then by specifying an R-C Rotary Positive Gas Exhauster that will do the work at low operating cost.



Type RCGH Rotary Positive Gas Exhauster, driven by 450 hp synchronous motor. Capacity, 20,600 cfm.

Even though your equipment to handle gas or air may still have years of life, it may be sound economy to replace it with modern, efficient, R-C units of the right type, size and drives to best meet your needs. Our engineers will help you analyze your problem and make unbiased recommendations of either Rotary Positive or Centrifugal equipment, depending upon your specific conditions. This *dual choice* is an exclusive R-C advantage.

With capacities from 5 cfm to 100,000 cfm, R-C units can be closely matched to work requirements, for dependable, economical performance. At Roots-Connersville, almost a century of blower building experience is at your service, without obligation.

Single-stage, Type OIB Gas Exhauster in gas utility plant. Capacity 39,950 cfm.

ROOTS-CONNERSVILLE BLOWER CORP.
151 Oregon Avenue, Connersville, Indiana

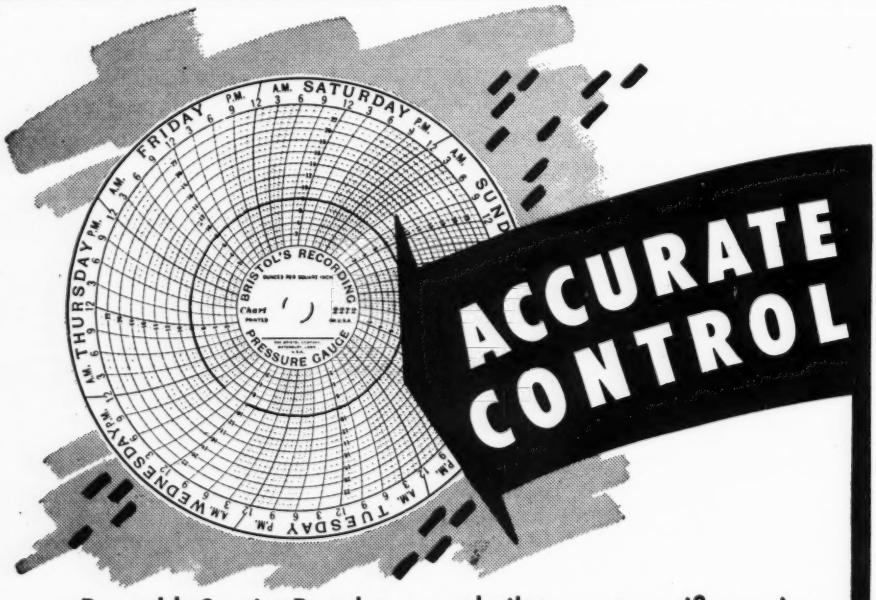
ROOTS-CONNERSVILLE
BLOWER BUILDERS SINCE 1854
ONE OF THE DRESSER INDUSTRIES

TRADE LITERATURE

REFINERY SUPPLY CO., 621 East 4th St., Tulsa 3, Okla.—Bulletin C50 includes listings of both R.S. and Ac-Me testing instruments for the petroleum industry. Fully described are recording gravitometers with or without controller, dead weight gauges, gas gravity balances, high pressure consistometers, moisture tester for gases, vapor pressure bombs, manometers, Yel-O-Back thermometers, etc. Copies are available upon request.

CRANE CO., 836 Michigan Ave., Chicago, Ill.—This firm has announced a new edition of its Piping Pointers manual covering, in non-technical language, fundamentals of sound piping practices and use of various types of valve designs. Included with the manual, designated Catalog 49, is an 8-page valve selection guide. A 30-min., 16-mm sound film dramatizing information in the manual for classroom or plant training groups is also available through Crane branches.

KEROTEST MANUFACTURING CO., 2525 Liberty Ave., Pittsburgh 22—A four-page folder has been issued describing the company's line of forged steel, union bonnet needle valves for high pressure corrosive services, plus a price list for the entire line. Valves described are available in ⅛-, ¼-, ⅜-, ½-, and ¾-in. sizes, for working pressures up to 4000 lb at 150°F.



Reynolds Service Regulators are built to meet specific requirements — years of operation in the field through a complete range of operating conditions have proved not only their superiority but their durability. With parts so precisely machined for each model that they are completely interchangeable. The accuracy you require in performance is assured.

MODEL 10

Dead Weight or Spring Type, with or without Mercury Seal, or Dead Weight Safety Seal or diaphragm operated relief valve. All working parts are so accessible as to be interchangeable without removal from pipe line.

MODEL 20

Dead Weight or Spring Type, with or without Mercury Seal, or Dead Weight Safety Seal or diaphragm operated relief valve. All working parts are so accurate as to permit complete interchangeability in shop.

MODEL 30

For horizontal or vertical connections, with or without removable valve pocket. Available with either Spring or Dead Weight adjustment. With or without Mercury or Dead Weight Safety Seal or diaphragm operated relief valve.

Reynolds Gas Regulator Co.
ANDERSON, INDIANA, U. S. A.
GAS CONTROL SINCE 1892

MINNEAPOLIS-HONEYWELL REGULATOR CO., Minneapolis 8, Minn.—The new and revised edition of the Honeywell heating controls catalog and price list is now available upon request. New information includes price classification letters, standard number of units shipped per carton, control system selection chart, thermostat heater data, and a new cross index. Also available is Catalog 9601 describing flame failure protection for industrial applications with Protectoglo, the new flame rectification principle of operation.

ROCKWELL MANUFACTURING CO., 400 N. Lexington Ave., Pittsburgh, Pa.—A colorful new manual with the first complete compilation of technical data covering the use of pneumatic, hydraulic, and electric operators for lubricated plug valves has been issued. Included are typical piping diagrams, arrangements for both side and top mounted motor controls, closing speeds, wiring data, and a group of photos of actual installations. Copies of this bulletin, V-214, are available upon request.

PEERLESS PUMP DIVISION, Food Machinery Corp., 301 West Ave. 26, Los Angeles 31—Copies of a 24-page bulletin describing the company's Fluidyne line are available. These horizontal end-suction centrifugal pumps are for general service, and may be driven by electric motors, affording a capacity range from 10 to 5500 gpm. Bulletin B-2300 includes a number of illustrations, specification sheets, and selection charts.

BABCOCK & WILCOX TUBE CO., Beaver Falls, Pa.—Technical Bulletin 12F contains information on analyses, physical and mechanical properties, creep-strength, short time elevated temperature tensile strength, and oxidation resistance of 14 of the more popular tubing steels. Included are data on carbon, intermediate chrome molybdenum and stainless steels used in high temperature, high pressure service.

JOHNS-MANVILLE, 22 East 40th St., New York 19—" JM-3000 Insulating Fire Brick," is a four-page illustrated folder describing the economic advantages, industrial applications, and refractory properties of this insulating fire brick for sustained use at 3000° F. Included are a table of physical and thermal characteristics of the brick and summarized information on accessory materials and other insulating brick made by the company.

CATERPILLAR TRACTOR CO., Peoria, 8, Ill.—The 1951 edition of "Caterpillar Products" contains a complete listing, with illustrations and brief specifications, on 81 current Caterpillar products. Eleven new models were announced in 1950, nine of which are included in this issue. Copies of this bulletin (Form 30081) are available upon request.

PARTLOW CORP., New Hartford, N. Y. —Bulletin 101 is a design and process engineer's guide to industrial temperature measurement and control through mercury bulb instrumentation.

REVERE COPPER & BRASS INC., 230 Park Ave., New York 17—A new brochure

titled "Life Extension for Condenser Tubes" is a report on extensive research done on causes of corrosion and means of combating them, as well as on the choice of condenser tube materials. The brochure, available upon request, includes a table giving estimating data for condenser and heat exchanger tubes in various alloys.

DRESSER MANUFACTURING DIVISION, Bradford, Pa. — A new 34-page catalog is devoted almost exclusively to the firm's line of Style 38 couplings and Style 40 long sleeves for joining steel and cast iron pipe. Available upon request, the bulletin also covers the Dresser line of compression fittings and contains a spread illustrating the principal types of clamps, repair sleeves, and expansion joints.

SELAS CORP. OF AMERICA, Erie Ave. and D St., Philadelphia 34, Pa.—A four-page, three-color bulletin titled "Vape-Sorber" describes this new product for removing petroleum vapors from compressed air and other gases used for instruments or pneumatic operations. Available upon request, the bulletin includes specifications, diagrams, and general information on this and other equipment for conditioning air-gases.

CARTERPILLAR TRACTOR CO., San Leandro, Calif. Form 30157, "Let's Talk Bulldozers," describes how easy blade adjustments boost production. A chart breakdown of optional D8 transmissions providing special reverse speeds for various job applications is included. Also featured are highlights of the new No. 8U Bulldozer for long haul dozing.

DRAVO CORP., Dravo Bldg., Pittsburgh, Pa.—Bulletin 1700, "Piping Fabrication and Erection," is a 24-page illustrated booklet showing piping installations for gas transmission systems, heating plants, and other applications.

CURRENT READING

AMERICAN STANDARD MALLEABLE-IRON Screwed Fittings — 300 lb, B16.19-1951 — American Standards Assn., 70 E. 45th St., New York 17. This is a companion document to 150 lb, B16c-1939. The 300-psi fittings are used primarily for very severe piping applications in the petroleum industry, for diesel engines, oil and gasoline lines, and steam at high pressures. The standard gives pressure - temperature ratings and dimensions for elbows, tees, couplings, caps, and return bends. It was developed by an ASA committee sponsored by the American Society of Mechanical Engineers, the Manufacturers Standardization Society of the Valve and Fittings Industry, and the Heating, Piping and Air Conditioning Contractors National Assn.

CLEANING PETROLEUM STORAGE TANKS; SECTION B — GASOLINE TANKS—Published by American Petroleum Institute, 50 W. 50th St., New York 20. This manual is a revised edition of one published in 1942. Illustrated with sketches and drawings, the second edition details the hazards of tank cleaning and covers such topics as ventilating and vapor-freeing, testing for vapor, disposal of sludge and sediment, repairs, personal protection, and masks. Price: 75 cents.

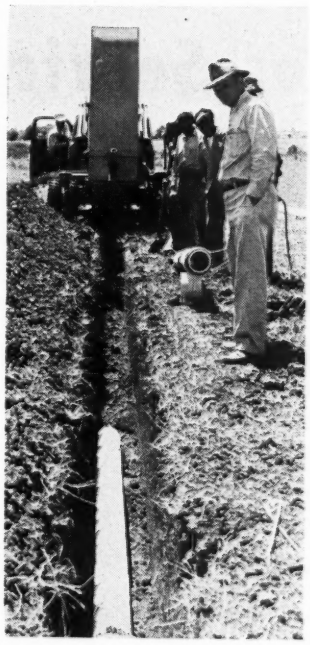
YOUR SOCIAL SECURITY BENEFITS—Published by Commodity Research Bureau, Inc., 82 Beaver St., New York 5. This handbook explains to the worker how much he is entitled to collect, as well as how and where to collect. Company officials may obtain free sample copies and detailed quantity price schedules.

OIL AND GAS PRODUCTION, An Introductory Guide to Production Techniques and Conservation Methods—Interstate Oil Compact Commission, P.O. Box 3127, State Capitol Bldg., Oklahoma City 5, Okla. This book, written in non-technical language by members of IOCC's engineering committee, has 140 pages. The text includes graphs, charts, and tables which illustrate the processes used to recover petroleum. Price: $2.75.

BIBLIOGRAPHIC SURVEY OF CORROSION — 1946-47 — Published by the National Assn. of Corrosion Engineers, 919 Milam Bldg., Houston 2. The 288-page, 8½x11-in. book contains more than 3000 abstracts arranged topically. Price is $7 to association members, $9 to others. It may be purchased in combination with the 1945 Bibliography at $9 to members, $12 to others.

PEWTHERS' "EARTHRIPPER"

OPENS THE EARTH LIKE A ZIPPER!



ECONOMICAL... Pewther's EARTHRIPPER saves money three ways! It costs less—it's speedy operation saves labor costs . . . and standardization of automotive parts cuts down maintenance costs. Construction engineers who use the Pewthers' EARTHRIPPER have found that it costs only 4c a foot to operate. This low cost covers initial investment, depreciation, operation, maintenance, and labor over a three-year period! With an EARTHRIPPER, one man can handle your ditching problems, from driving the machine to the ditch site to lowering the boom and opening the earth at a maximum rate of twenty feet a minute! Because all gears run in oil, the EARTHRIPPER can be used for years with few replacements of parts. If you want to save time and money, invest in an EARTHRIPPER today.

MOBILE... The EARTHRIPPER is versatile because it is mobile. On the highway its speed is the speed of the truck. The raised boom clears telephone wires and tree branches, making transit easy and speedy, even in heavy city traffic. The EARTHRIPPER digs vertical ditches in any kind of terrain under almost any digging conditions. On slopes the frame levels. While the tires follow the contour of the earth, the ditcher digs a vertical ditch! If you need a ditcher for large or small ditching jobs, the EARTHRIPPER can solve your problems.

EFFICIENT... For straight, clean ditching, the answer is Pewther's EARTHRIPPER. This new, unique ditcher offers a complete different design. It is the first ditcher to be built into a truck. Bucket design saves time because there is no loss of time in cleaning. Bottom of each bucket forms the top of the preceding one. The buckets separate as they go over the top sprocket, throwing the dirt onto the conveyor belt. Conveyor belts throw the dirt on either side of the ditch and can be reversed on a moment's notice. In competition the EARTHRIPPER digs straight ditches with clean sides . . . in record time.

Pewther's "EARTHRIPPER" is the only ditcher built into a truck. This means *one man* can handle your ditching job, from driving the machine to the ditch site to opening the earth to a maximum depth of five feet. The EARTHRIPPER is particularly suited for gas lines, extensions and house-to-street service lines. Utility ditching requiring ditches 10", 14", or 18" wide are duck soup to this new, *different* Pewthers' ditcher.

Send for the folder on the new Pewther's ditcher, the EARTHRIPPER. Learn for yourself how the EARTHRIPPER can save time and money on any small ditching job! Ask for a demonstration before purchase . . . at any point in the United States!

I want the new folder on the Pewther's "EARTHRIPPER."

NAME_____ TITLE_____

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I saw this ad in the above magazine.

PEWTHERS DITCHER COMPANY

3530 MANSFIELD ROAD • SHREVEPORT, LOUISIANA

PEOPLE

Wm. Moeller Jr.

Grove Lawrence

Retirement of WILLIAM MOELLER JR., vice president of Southern California Gas Co., Los Angeles, on July 1 and election of GROVE LAWRENCE, assistant vice president, to succeed him, were announced last month. Mr. Moeller has been associated with SoCal and a predecessor, Midway Gas Co., Taft, Calif. since 1914. He rose to the position of general manager of Midway and, when the firm was merged with SoCal in 1922, he became manager of natural gas production and transmission. In 1929 Mr. Moeller became a director of the company and was named vice president in 1932. An active gas association member, he served as PCGA president in 1934-35, having previously been a director, chairman of the technical committee, and first vice president. Other activities included chairmanship of the AGA natural gas committee and membership on the Petroleum Industry War Council and the CNGA executive committee and board of directors. Mr. Lawrence joined SoCal in 1925, served as manager of the butadiene production department during World War II, and then became assistant vice president.

Modern Controls Corp., Centerline, Mich., has announced the appointment of JAMES V. BURGESS as sales manager in charge of dealer, jobber-wholesale, and manufacturer contacts. Mr. Burgess will replace ALBERT E. STEVENSON, who recently resigned because of ill health.

Promotion of BURL S. WATSON to the executive vice presidency of Cities Service Co., New York, was announced recently. In addition, EMIL SCHRAM, former president of the New York Stock Exchange, was elected to the company's board of directors. Mr. Watson joined Cities Service in 1917.

At a recent meeting of the board of directors of Peoples Gas Light & Coke Co., Chicago, REMICK McDOWELL, former assistant secretary, was elected vice president and secretary, and JOHN J. NOVY was named assistant vice president of operation.

Nordberg Manufacturing Co., Milwaukee, has transferred W. C. YOUNG, sales engineer, to its Washington, D. C. office and has appointed JOSEPH M. MONROE, former installation engineer, to assume Mr. Young's duties in Milwaukee.

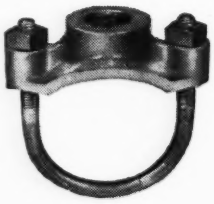
A. F. OGDEN JR. has been appointed auditor for Kentucky West Virginia Gas Co. with headquarters at Ashland, Ky. He joined the company in 1928 and has recently been chief clerk and statistician.

Rockwell Manufacturing Co., Pittsburgh, has announced the election of three men to new positions. C. K. HUBBARD, manager of the national accounts department, is now a vice president. He joined the firm in 1936 and served as a national representative and later as assistant to the vice president of sales. New Pacific coast supervisor of Nordstrom valve sales is A. A. FOMILYANT. Formerly, his activities with the company were confined to the oil refining industry. NORMAN W. ROWAND has been named general manager of the Pittsburgh plant of the meter and valve division. He was previously chief industrial engineer for the Pittsburgh-DuBois division and plant manager of the regulator division, Norwalk, Ohio.

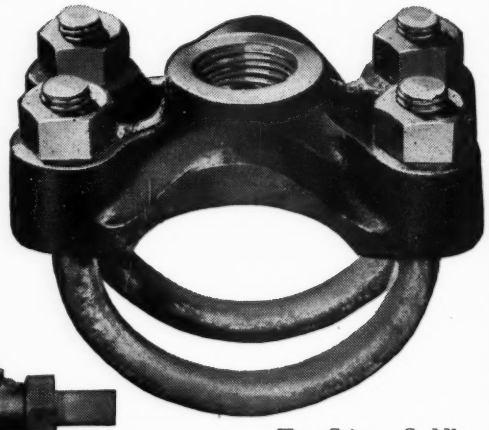
N. W. Rowand

C. K. Hubbard

DRESSER SADDLES
for Service Connections

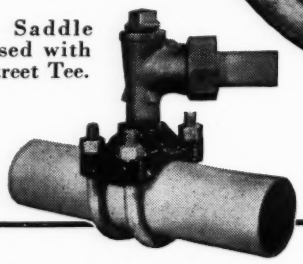


Single Stirrup Malleable Saddle available in sizes 1½" to 4" I. D.



Two Stirrup Saddle available in sizes 2" to 12" I. D.

Dresser Saddle can be used with Dresser Street Tee.



Dressser Style 91 Pipe Saddles provide an economical method for making service connections to steel and cast iron pipe when other methods are not practicable.

These ruggedly built saddles are easy to install, and come equipped with specially compounded Dresser rubber gaskets suitable for practically all services. Because of their resilience, these gaskets keep the connection tight despite line movements, and permit working pressures considerably higher than those obtainable with lead gaskets.

Dresser Pipe Saddles are made in single and double stirrup models, in a complete range of sizes and with both American Standard and Mueller corporation taps. Also available from Dresser is a complete line of service fittings for all piping needs. Write for details and specifications.

DRESSER PIPE SADDLES

Dresser Mfg. Division (One of the Dresser Industries), 59 Fisher Ave., Bradford, Pa.
In Texas: 1121 Rothwell St., Houston • In Canada: Toronto, Ontario • Sales Offices: New York, Chicago, Houston, Philadelphia, San Francisco

Chas. Stang Jr.
... Detroit Reg.

Carl E. Cluff
... Portland Gas

Detroit (Mich.) Regulator Co. recently announced the appointment of CHARLES STANG JR. to its engineering staff. Mr. Stang, formerly with the utilization division of Surface Combustion Corp., Columbus, Ohio, will head Detroit's newly created research and development department.

A new position at Portland (Ore.) Gas & Coke Co. was filled in May when CARL E. CLUFF, former managing editor of the Sandy, Ore. *Post,* was named publicity director. Mr. Cluff, formerly circulation manager of the *Daily Olympian* at Olympia, Wash., is now responsible for all phases of public information on company matters.

On June 1 ERICK LARSON resigned as president of Commonwealth Natural Gas Corp., Charleston, to become a partner in Gas Construction and Service Co. Inc., New York consulting engineering firm. Mr. Larson will continue as a member of the Commonwealth board of directors. WILLIAM H. TRAPNELL, former vice president and general manager of Chesapeake & Potomac Telephone Co. of Virginia, has been elected chairman of the board of Commonwealth.

Ohio Fuel Gas Co., a member of Columbia Gas System's Columbus Group, has advanced two officers and named a new vice president and general manager. EARL C. OVERBECK, president, has succeeded C. I. WEAVER as chairman of the board of directors and chief executive officer. Mr. Weaver retired recently. WILLIAM N. GRINSTEAD has been elected president and his post as vice president and general manager has been filled by ALLAN W. LUNDSTRUM, who was also elected a director. Mr. Lundstrum was wartime deputy director of the Gas Division, Office of War Utilities, and for the past five years he has worked with companies manufacturing Safaire gas heaters under patent rights which he controls.

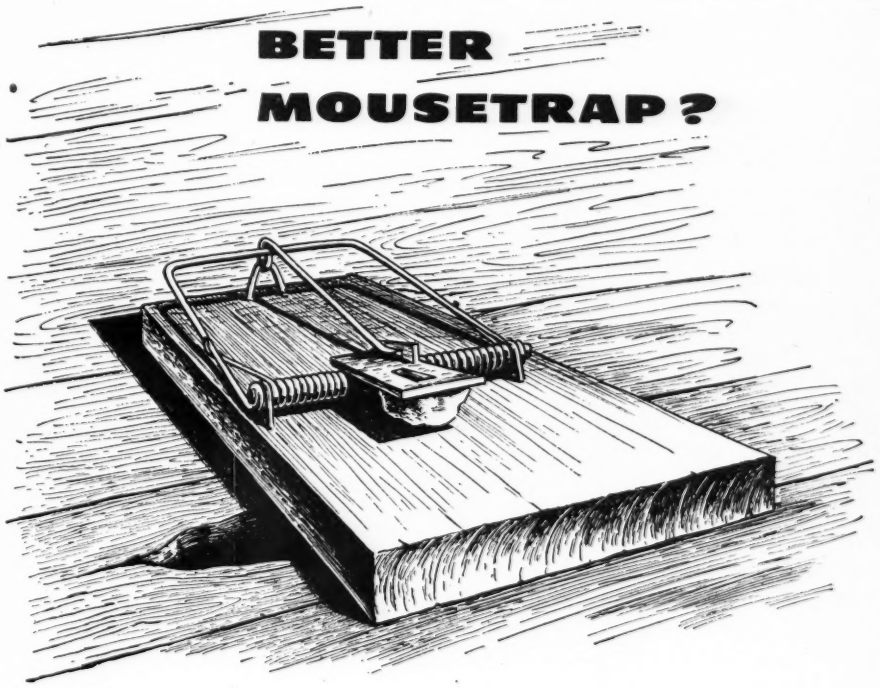
FROM LEFT: Allan W. Lundstrum, William N. Grinstead, and Earl C. Overbeck.

ROBERT E. PENNY, Los Angeles branch manager for the Crane Co., Chicago, recently was appointed district manager of Pacific coast operations. Mr. Penney joined the company 26 years ago as manager of the San Bernardino, Calif. office.

Detroit (Mich.) Brass & Malleable Works has announced the appointment of two additional vice presidents, O. H. WELKE, in charge of the malleable division at Wyandotte, Mich., and WILLIAM J. WILDERN JR., in charge of the brass division at Detroit. Mr. Welke joined the company in 1922 and served as a draftsman, assistant superintendent, and assistant plant manager, while Mr. Wildern became affiliated with Detroit Brass in 1940, having served as salesman, production manager and manager of the gas valve division. Mr. Welke became a member of the board in 1947.

O. H. Welke

W. J. Wildern Jr.



The story of the reward for a better mousetrap is proverbial. But the fact remains that most mice are still caught by this simple, economical and effective contraption.

Gas purification is a parallel case.

Iron Sponge, preferred for the removal of H_2S seventy-five years ago, is still preferred today. And for these same reasons . . . simplicity, economy and effectiveness.

Iron Sponge operates with high efficiency at high or low pressures, has excellent capacity and activity, gives long service between foulings and is simply and quickly regenerated.

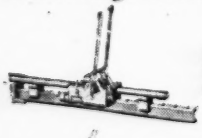
CONNELLY, Inc.

3154 S. California Ave., Chicago 8, Ill.
Elizabeth, N. J. • Los Angeles, Calif.

CUT COSTS ON UNDERGROUND PIPING JOBS

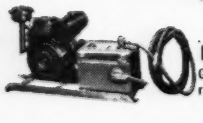
...with a GREENLEE PIPE PUSHER

Installing pipe underground is quick and simple this way. With a GREENLEE Hydraulic Pipe Pusher *one man* pushes pipe through the ground—under streets, railways, walks, lawns, floors. Saves time, cuts costs through elimination of extensive ditching as just a short trench accommodates the Pusher. No tearing up of pavement, lawns, floors... eliminates tunneling, back-filling, tamping, repaving. Cuts job time to a fraction. Pusher often pays for itself through timesavings on first job or two.



No. 790 GREENLEE PUSHER For 3/4 to 4-inch pipe. Six speeds—5,600 to 40,000 lbs. pushing pressure.

No. 795 GREENLEE PUSHER For pipe larger than 4-inch, concrete sewer pipe, large drainage ducts. Six speeds—25,000 to 150,000 lbs. pushing pressure.



POWER PUMP For both sizes of GREENLEE Pushers. Pushes pipe at rate of two feet per minute.

TOOLS FOR CRAFTSMEN
GREENLEE

Get facts on timesaving Greenlee tools now. Write Greenlee Tool Co., Division of Greenlee Bros. & Co., 1947 Columbia Avenue, Rockford, Illinois, U. S. A.

C. E. Loomis

E. D. Bivens

Columbia Gas System Inc. has announced a number of elections and appointments, including the naming of four new vice presidents. C. E. LOOMIS was elected vice president of Columbia Gas and of Columbia Engineering Corp., the service subsidiary, moving from assistant vice president of both companies. E. D. BIVENS, treasurer of both companies, resigned to become vice president and director of the Charleston Group of the system. OLIVER S. HAGERMAN moved from president of the Charleston Group to chairman, and JOHN W. PARTRIDGE was elected president. FRANCIS H. CRISSMAN, former assistant treasurer of the parent and the subsidiary, was elected treasurer of Columbia Gas and remains as assistant treasurer of Columbia Engineering. E. R. CONNER moved from assistant vice president to vice president of Columbia Engineering Corp., and JAMES S. PHILLIPS, director of purchasing, also became a vice president of Columbia Engineering. Other appointments included CHARLES H. MANN to treasurer of Columbia Engineering and assistant treasurer of the parent, ALAN A. CULLMAN to the new post of controller of the subsidiary, and MORTON LEWIS to assistant treasurer of Columbia Gas. The following were named to new positions with Columbia Engineering: FRED W. BATTEN, assistant vice president; LEON M. PLASTERER and LAWRENCE VOSE, assistant treasurers; ALBERT V. SCHWARTZ, assistant controller, and HARRY C. DAVIES, assistant general auditor.

ROY E. JONES, vice president of North Shore Gas Co., Waukegan, Ill., resigned May 31 to become executive vice president of Peoples Water & Gas Co., North Miami, Fla. Mr. Jones began his career with utilities in Colorado and Ohio and had been with North Shore for the past nine years.

Carl H. Horne

Rheem Manufacturing Co. has appointed CARL H. HORNE sales manager of its refrigerator division. Mr. Horne, who recently resigned as vice president in charge of sales, Alabama Gas Corp., Birmingham, has been an active AGA and SGA member for many years. He heads the new sales division which will direct distribution of Rheem's gas refrigerator, for which plans were announced last November. Mr. Horne will headquarter at Rheem's office in New York.

J. S. Phillips

E. R. Conner

Two executives of Servel Inc., Evansville, Ind., have been awarded honorary degrees. LOUIS RUTHENBURG, board chairman, received a Doctor of Humanities degree from Evansville (Ind.) College, and W. PAUL JONES, president, was given a Doctor of Laws degree from Oakland (Ind.) City College.

At a recent meeting of the Brooklyn (N. Y.) Union Gas Co. board of directors, present company officers were re-elected and at the same time SAMUEL GREEN, assistant chief engineer, was elected chief engineer and A. DUDLEY HARRISON was named to succeed Mr. Green.

Samuel Green ... *Brooklyn*

R. C. McLaughlin ... *Roper*

Geo. D. Roper Corp., Rockford, Ill., has announced the recent appointment of ROBERT C. McLAUGHLIN as chief testing engineer. Mr. McLaughlin has been associated with Roper since 1937 in various capacities in the inspection and test departments.

Among recent appointments at Equitable Gas Co., Pittsburgh, were those of ROBERT E. McCARTHY as tax accountant, statistics and accounting division, and WILLIAM H. BOUNDS as gas measurement engineer, production and transportation department. Four distribution department employees were promoted: A. F. HOEHLE was named assistant to the general superintendent of distribution, and J. R. DiVITTORIO succeeded him as superintendent of Division A. JAMES K. FINN was transferred from assistant superintendent of Division B to the same position in Division A and J. R. HEADLEY took over his former post.

General American Transportation Corp., Chicago, has announced that BEN KING DUFFY, sales engineer, has been appointed district sales manager of the plate and welding division for the Pittsburgh district, which embraces the western half of Pennsylvania, eastern half of Kentucky, and the states of Ohio, West Virginia, and Tennessee.

J. P. Cosgrove

J. PHILLIPS COSGROVE, vice president of the company's European divisions, was recently elected executive vice president of American Radiator & Standard Sanitary Corp., Pittsburgh. At the same time, three officers were promoted and four others named. JOSEPH A. GRAZIER, secretary; JOHN E. KING, treasurer; and WALTER WHITTAKER, comptroller, were elected vice presidents. New officers are THOMAS W. McNEILL, vice president, purchasing; JOHN C. REED, vice president, research; HOWARD L. SPINDLER, vice president, public relations; and ALBERT W. SWAN, assistant treasurer.

Peoples Gas Light & Coke Co., Chicago, has announced the June 1 retirement of HARRY E. BATES, chief technical engineer, after 42 years of service . . . DAVID E. FEINBERG, former manager of the refrigeration division of United States Air Conditioning Corp., Minneapolis, has been elected a vice president of the company . . . Combustion Control Corp., Cambridge, recently announced the appointment of LAURENCE D. SIBLEY, former general sales manager to vice president in charge of sales.

Eclipse Fuel Engineering Co. has announced the appointment of CHARLES W. GUPTIL as its St. Paul, Minn. representative, replacing HENRY E. BALSLEY, who retired July 1 . . . RAY A. DOMAN has been named chief civil engineer for New York State Natural Gas Corp., Pittsburgh . . . Rockwell Manufacturing Co.'s new assistant sales manager of LP-Gas products at ROBERT A. JOHNSON, formerly sales engineer in the firm's Atlanta district . . . JOHN J. WINN JR. has succeeded John P. Doyle as manager of the port of Portland, Ore. Mr. Winn was commercial manager of Portland (Ore.) Gas & Coke Co. from 1936 to 1942, became general manager of Honolulu Gas Co. in 1946, and moved to Petersburg (Va.) & Hopewell Gas Co. in 1949. He has resigned as manager of the Virginia firm.

Obituaries

Dr. J. J. Wittmer

On May 19, DR. JOHN J. WITTMER, 55, vice president of Consolidated Edison Co. of New York Inc. and a recognized authority in the field of industrial medicine, died of a heart attack. Under his direction, a medical and benefits program was developed for ConEd's employees which is considered a model for American industry. Dr. Wittmer served successively as staff physician, supervising physician, medical director, and personnel director.

ALFRED F. BERRY, retired commercial sales manager of the Consolidated Edison Co. of New York, died recently at his home in New Rochelle at the age of 67. A longtime employee of ConEd, Mr. Berry was a member of the Electric and Gas Assn. of New York City.

FRANK B. LONG, retired vice president of Oklahoma Natural Gas Co., Tulsa, died on May 7. In charge of the firm's land and lease department at the time of his retirement in 1946, Mr. Long was a past president of the Oklahoma Utilities Assn. as well as a director of the Independent Petroleum Assn. of American and the Mid-Continent Oil and Gas Assn.

Detroit-Michigan Stove Co. announced the recent death of NELSON L. MILLER, 45, director of research engineering. Mr. Miller, associated with Detroit-Michigan since 1934, was formerly affiliated with the AGA Laboratories and served on many of the association's engineering committees. At the time of his death Mr. Miller was chairman of the subcommittee to establish "Approval Requirements for Commercial Cooking Equipment."

JAMES WILLIS YELDELL, vice president in charge of operations for Southern Natural Gas Co., Birmingham, died May 21 at the age of 46. He had been associated with the company since 1930.

ARCCO
The World Over
—wherever there is gas
ARCCO-ANUBIS
'Dry-Air GAS
GRAVITOMETERS
This new Arcco-Anubis Dry Air Gas Gravitometer determines and records specific gravity of gases automatically corrected to the humidity content of the air. The difference in weight between a column of GAS and equal column of DRY AIR is measured. This ratio represents the true specific gravity of the sample.
One bell of the instrument is filled with gas which is being measured, and the other bell is filled with dry air. Otherwise, except for the new instrument having one column for gas and one column for dry air, the unit is identical in operation to the standard gas gravitometer. When calibrated and properly installed, these instruments require little attention other than to wind the clock, ink the pen, and change the chart. Send for bulletin No. 101.
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Available for Early Delivery
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ABSTRACTS

Presented in the following items are abstracts of papers delivered at the AGA Production and Chemical conference in New York, May 14-16.

REFORMING NATURAL GAS BY THE CONTINUOUS CATALYTIC CRACKING PROCESS—by S. W. Horsfield.

Experience thus far gained in the operation of the Glenwood Landing, Long Island, plant has indicated that the catalytic cracking process is entirely satisfactory for the conversion of natural gas into a gas that is completely interchangeable with the carburetted water gas produced by the plants of the Long Island Lighting Co.

The chief advantages of the process are:

1. Its high cracking efficiency and complete automatic operation make possible low operating cost.
2. Its continuous method of operation makes possible uniformity and precision of control.
3. It may be designed to require no other fuel or raw material than natural gas.
4. It can be operated using propane or butane in the event of a natural gas failure.
5. It requires no gas purification.
6. Producing no smoke or dust, it may be tolerated in highly residential locations.
7. On a complete new plant basis it has a low investment cost per Mcf.

RECENT EUROPEAN DEVELOPMENTS IN THE USE OF OXYGEN IN GAS MANUFACTURE—by L. L. Newman.

From the summary of some of the European activities in gas production, it is obvious that the principal factor governing the choice of gasification processes requiring oxygen now undergoing development is the need for utilizing inferior fuels. Even where premium fuels are available (as at the coke plant in The Netherlands State Mines), the use of oxygen also appears to be desirable, since it results in considerable saving of fuel, increased capacity, and lower costs of labor for operation and maintenance.

However, oxygen, because of high capital cost, continues to be considered as a base load proposition and is given first consideration for large-scale production of synthesis gas for ammonia, methanol, and liquid fuels. Nevertheless, as indicated by the work of the Gas Research Board in England and of Ruhrgas in Germany, oxygen gasification is receiving considerable attention for public utility distribution. As the first step in the synthesis of pipeline gas, it will become of increasing importance to the gas industry in the United States as the number of natural gas pipelines increases and the demand continues to rise.

OIL GAS PRODUCTION ON THE WORLD'S FIRST REVERSE FLOW REGENERATIVE MACHINE, POUGHKEEPSIE, N.Y.—by R. J. Horn.

Faced in 1950 with the necessity of providing facilities to supply gas for shaving natural gas peaks and to substitute for natural gas in times of shortage or emergency, Central Hudson Gas & Electric Corp. decided on the conversion of existing water gas sets to make high-Btu oil gas.

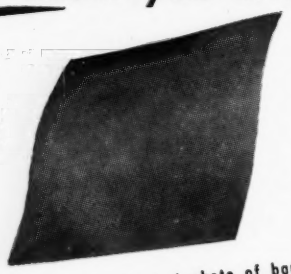
In an endeavor to obtain high capacity, assure continuous operation, provide for using high carbon oils, reduce labor requirements to a minimum, and achieve high efficiency, it was decided to convert one 11x11x11-ft water gas machine with a complete conversion job to the high-Btu oil gas process, and to make a simpler conversion on five other machines. The conversion of this 11-ft set was completed in October 1950 and the machine operated throughout the 1950-51 winter period.

The operation of the reverse flow regenerative process selected for the complete conversion of this machine met all the contemplated requirements of Central Hudson. Capacities of approximately 200 Mcf per hour with low carbon oil, 183 Mcf with 3.2% carbon oil, and 150 Mcf per hour with Bunker C oil (5.3% carbon) were established.

PROCESS VARIABLES AND OIL SELECTION FOR HIGH-BTU OIL GAS PRODUCTION—by H. R. Linden and E. S. Pettyjohn.

During the past year, as a result of widening interest in high-Btu oil gas, the study of oil gasification at the Institute of Gas Technology was directed toward the operating problems of this process. These operating problems seemed to consist in most part of

PARBOILED for 15 minutes to show you why . . .



BEFORE—Unretouched photo of bark tanned leather.

BEFORE—Unretouched photo of re-chrome leather used exclusively in all Lancaster Metal Rim and Tin Meter Diaphragms.

AFTER—The same leather, unretouched, after boiling for 15 minutes. See how it has shrunk in size and become wrinkled. The fine fibers between inner and outer skin are broken and lifeless. All pliability is gone and it is now hard as rock.

AFTER—The same leather, unretouched, after boiling for 15 minutes. Notice how the re-chrome leather is still pliable and drapes over the supporting block underneath. There are no wrinkles, and the fine fibers between inner and outer skin are still spongy and "alive."

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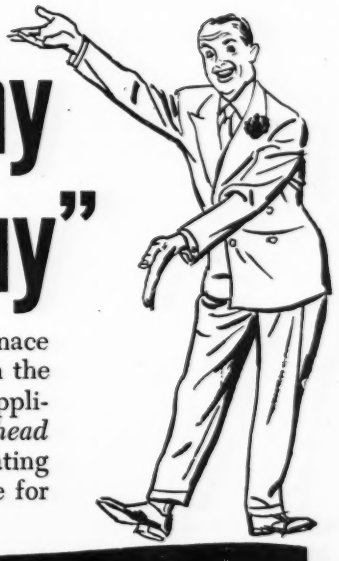

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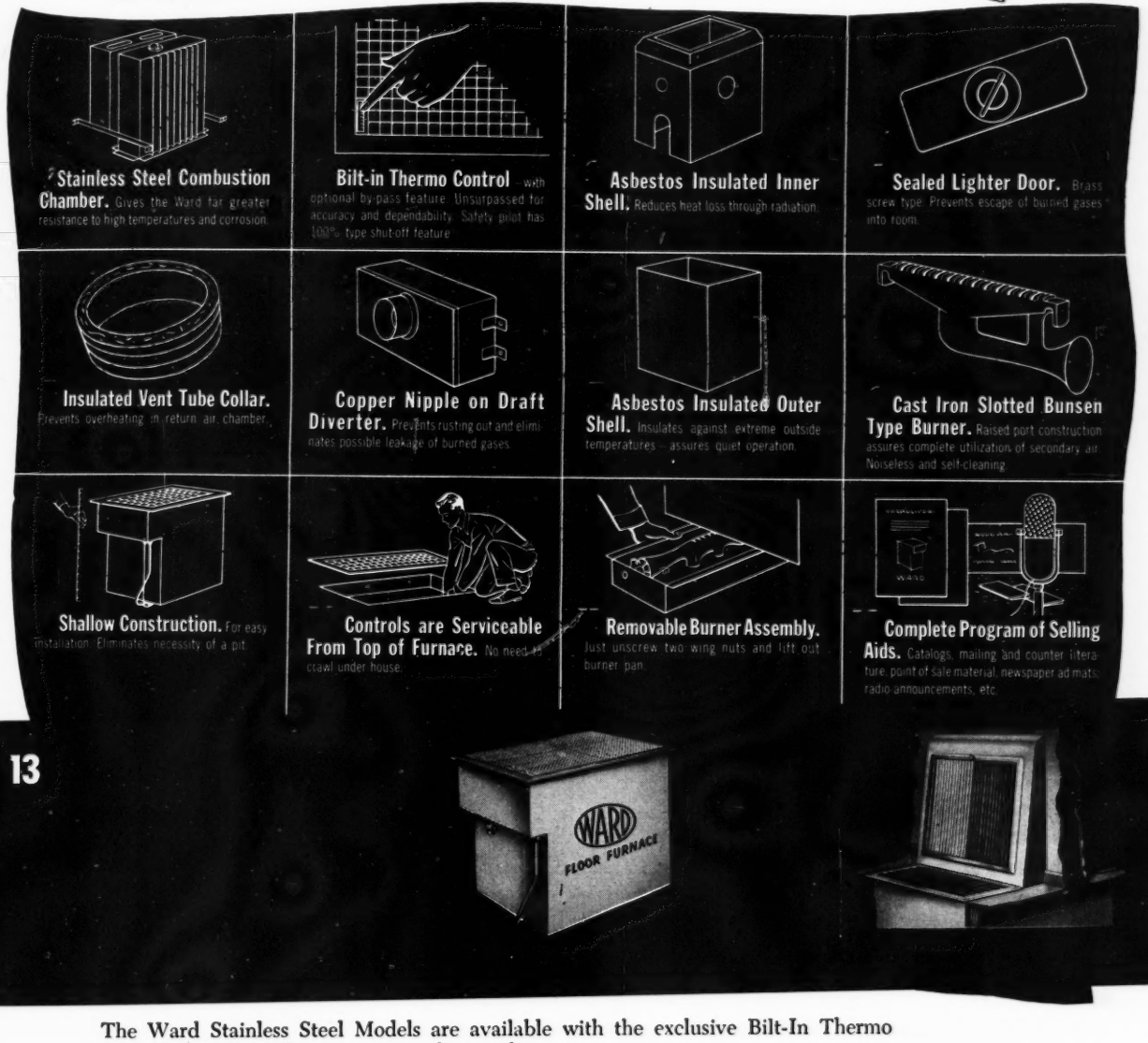
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TABLE 1. Effects of Changes on Controlling Variables in High-Btu Oil Gas Production

Relative Importance	Thermal Recovery, Btu/Gal.	Total Volume of Oil Gas, Scf/Gal.	Carbon and Coke Formation Wt. % of Make Oil	Heating Value of Oil Gas	Composition of Gaseous Product		
					Free H_2 % by Vol.	Illuminants % by Vol.	Ratio of Sats./Unsats
Greatest	C/H*(—)	Cracking Temp.(+)	Conradson carbon res. of oil (+)	Cracking temp.(—)	Cracking temp.(+)	Cracking temp.(—)	Cracking temp.(+)
Great		C/H*(—)	Cracking temp. + C/H(+)				
Definite	Part. Press.(—)			Res. time (—)	Res. time (+)	Res. time (—)	Res. time (+)
Slight	Cracking Temp.(±)	Res. time (+)	Res. time(+)	C/H(—)	C/H(+)	Part. press. (—)	Part. press. (+) C/H(+)
Least	Res. time (±)		Part. press. (+)	Part. press. (—)	Part. press. (±)		
None (?)		Part. press.					

(+ and — signs indicate effects on operating results at top of column of increases in the numerical expression of the operating variable.)
*At constant API gravity.

(a) selection of proper oils, and (b) control of operating conditions to permit trouble-free production of oil gases of specified nature from various oils.

The primary objectives of the PAR plan projects sponsored by the gas production research committee of the American Gas Assn., "Oil Gasification," (Project CPR-23) during 1950, and "The Production and Utilization of Oil Gas," (Project PB-8) during 1951, were to study the variables affecting oil gasification and to determine the influence of these variables on the yields and characteristics of the oil gases, tars and the coke or carbon produced. A complete presentation of the results of this work through March 1951 will be made in an Institute of Gas Technology bulletin in the near future. This paper covers only the highlights of the material which will be found in the bulletin.

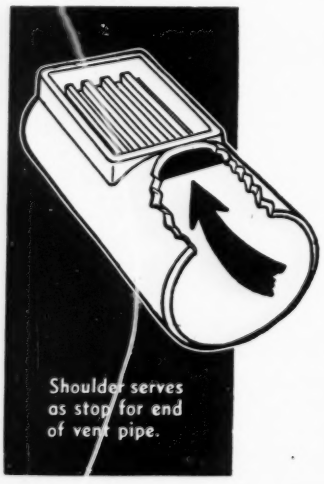
It presents a short summary of the results obtained in a laboratory study of thermal gasification of typical gas-making oils under operating conditions simulating present and anticipated high-Btu oil gas manufacturing practice using a 2½-in. diameter laboratory cracking tube. The operating variables considered were the cracking temperature, the residence time at temperature, and the partial pressure of the oil gas leaving the cracking zone. The oils were characterized by their carbon-hydrogen weight ratio and their Conradson carbon residue.

Steam and nitrogen were used as diluents or carrier gases and were found to have the same effects on cracking results at equivalent volume concentrations in the 1350 to 1700° F cracking temperature and 1 to 5 seconds residence time ranges. Btu recoveries in the finished make gas, total oil gas yields, tar plus carbon yields, carbon deposition, tar properties, and oil gas composition were correlated with operating variables and oil properties and these correlations are presented in graphical and mathematical form. The correlations were tested against plant results and the agreement found between laboratory and average plant results was as good or better than between individual oil gas sets.

A tabulation of the relative importance of the effects of the variables influencing oil gas production is shown in *Table 1*. From this tabulation it can be concluded that few of the operating variables of an oil gas production operation are supplementary or interchangeable and overall improvements cannot be attained by changing only one of the controlling variables.

Any specific improvement gained may be offset by an adverse effect on some other oil gas feature. If the temperature is raised to increase the gas yield, more carbon will be formed, and the heating value will be lower. If more steam is added to increase the Btu recovery by reducing the partial pressure, the illuminants concentration of the gas will increase as a direct result of higher steam dilution as well as the secondary effects of shorter residence time and possibly lower cracking temperatures. Further, the range in which lower cracking temperatures may be offset by higher residence times, or vice versa, appears to be limited.

The variation of tar properties with changes in operating conditions and oil properties are so severe that regardless of gasification efficiency and the nature of the oil gas produced, operating conditions must be selected to permit the production of a tar that can be satisfactorily handled in the plant. This requires that strict limitations be set on the range within which the operating conditions may be varied for a series of typical oils after the data presented here have been correlated with specific plant operating results.



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HOMESTEAD VALVE MANUFACTURING CO., P. O. Box 550, Corapolis, Pa.

MODEL: Fig. 502 GW Reiser valves.

DESCRIPTION: Port area of these valves is equivalent to 100% of the area of standard pipe. They are cast in semi-steel in 8-, 10-, and 12-in. sizes. The company plans to make this line available in a cast-steel, full-port type to be known as Fig. 562 GW, and in venturi type sizes up to 14-in. The venturi-type will have face to face dimensions identical to those of like-sized series 15 wedge gate valves and will be designated Fig. 512 GW for semi-steel and Fig. 572 GW for steel.

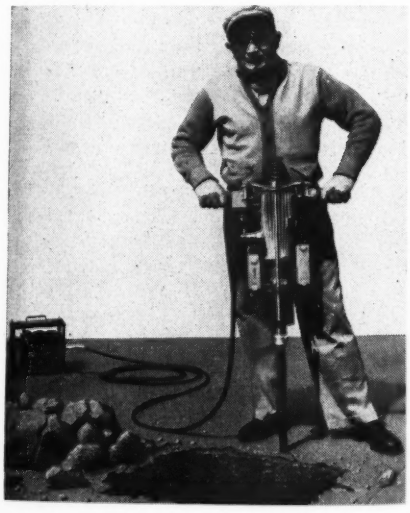
Portable Gasoline Hammers

BARCO MANUFACTURING CO., Dept. J-63, 1801 W. Winnemac Ave., Chicago 40.

MODEL: J-2 shown in illustration.

APPLICATION: For pavement breaking, rock drilling, spading, and tamping.

DESCRIPTION: A simplified arrangement of parts is made possible by use of a new, compact ignition coil-vibrator-condenser assembly located in the right hammer handle. With the coil in the handle, the length of high tension lead is reduced from 10 ft to about 5 in. The vibrator is a continuous vibrating type, not dependent on time point contact, which insures a faster initial spark



and easy starting in all weather, the manufacturer states.

Power source is an ignition battery, and fuel used is regular grade motor gasoline to which lubricating oil is added. For continuous operation, normal fuel consumption is 1 qt of gasoline per hour. Standard Model J-2 weighs 72 lb and delivers up to 1550 strokes per minute.

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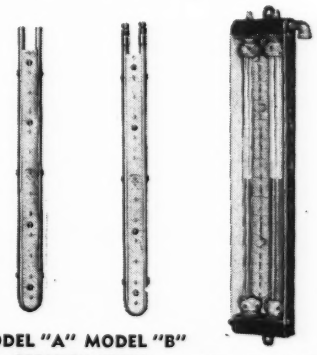

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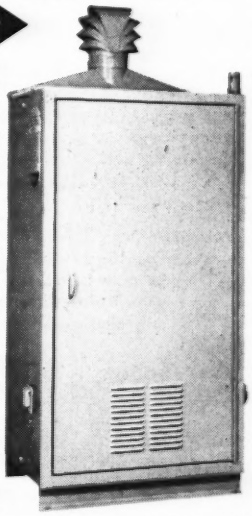

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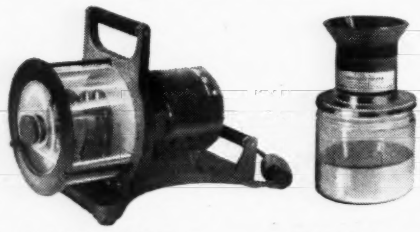

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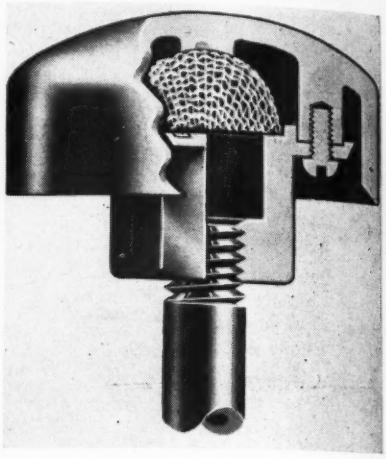
Breather Vents

UNIVERSAL CONTROLS CORP., 731 W. Davis St., Dallas 8.

MODELS: 600 (illustrated), 800, 850, and TS-33.

DESCRIPTION: A hood or "umbrella" shields the vent opening from rain and a thin-edged lower hood-rim sheds water rather than encouraging it to gather and freeze, a protected opening is scientifically sized to keep out insects while permitting free and unrestricted flow of air or gas, and



an optional splashproof and bugproof bronze mesh screen is installed internally.

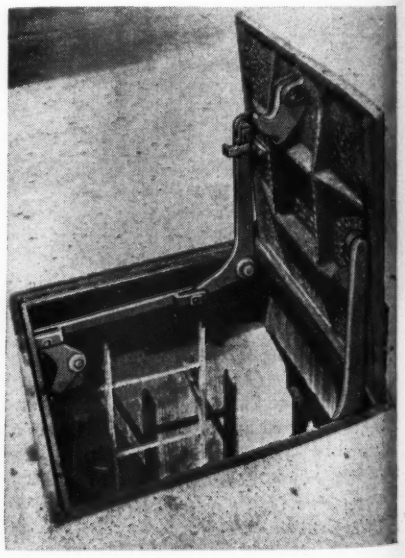
The four models are designed for specific purposes: 600 for regulators having diaphragms in a horizontal plane, 800 for regulators with built-in vent openings facing the ground, 850 for use as a diaphragm breather or combination breather and relief vent on regulators with pipe opening facing the ground, and TS-33 for regulators with horizontal or side vent outlets of ¼- or ⅜-in. female pipe threads.

Safety Vault Cover

E. H. WACHS CO., 1527 N. Dayton St., Chicago 22.

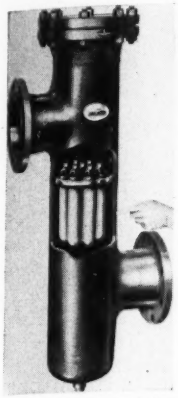
MODEL: Safety counterbalanced vault or manhole cover.

DESCRIPTION: Opening is accomplished by inserting a combination key-handle and



giving it a half turn. Lifting the cover to its vertical open position is a one-hand job because counterweights, which also hold the cover in a protective upright position, ease the load. Other advantages claimed by the manufacturer are these: (1) one man can safely raise cover with ease, (2) cover can be opened from inside vault by one man, (3) positive tamper-proof lock cannot be opened without key-handle, (4) counterbalance structure protrudes less than 6 in. from wall, (5) 30-in. square opening is provided, and (6) heavy duty cast iron frame and ribbed steel cover are machined for accurate, rattle-proof fit.

Gas Cleaner



SELAS CORP. OF AMERICA, Erie Ave. and D St., Philadelphia 34.

MODEL: Liquijector.

APPLICATION: For removing contaminating water, free oil, water-oil emulsions, and dirt from large volumes and high pressures of compressed air and other gases.

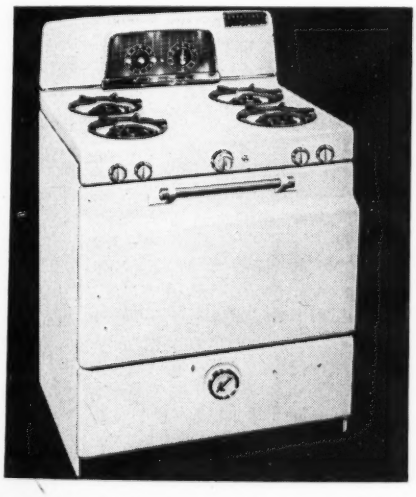
DESCRIPTION: Clean air-gas is delivered continuously to instrument or pneumatic systems through specially prepared liquid-impervious ceramic filters. Liquids and dirt are ejected automatically. The device does not have any moving parts.

Domestic Range

KALAMAZOO STOVE & FURNACE CO., Kalamazoo, Mich.

MODEL: Golden Jubilee.

DESCRIPTION: Outstanding features of the new 30-in. range are full width oven, re-



movable glass-bottom broiler, Glow-Light glass panel with automatic oven control and minute-minder, and Golden-Glass oven handle with cook chart dial. The broiler, claimed to be smokeless, has a drip pan for draining off grease. The Glow-Light panel illuminates the work surface when light from a fluorescent lamp passes through a photosensitive glass panel, and louvers in-

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NATURAL GAS PIPE LINE COMPANY LOCATED in northwest has opening for gas measurement engineer or accountant, age under forty, for general supervision of gas measurement and accounting for pipe line system. Replies confidential. Box 90, GAS, 198 So. Alvarado, Los Angeles, Calif.

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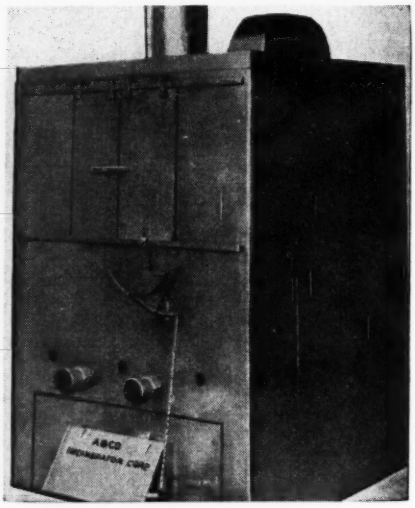
side the glass diffuse the light. A complete cooking chart is printed on the inside of the heat-tempered glass tube which is the oven handle.

Incinerator

ABCo INCINERATOR CORP., Cleveland, Ohio.

MODEL: LP2-15 commercial incinerator.

DESCRIPTION: This air-cooled, automatic, gas-fired incinerator of durable steel consumes wet or dry garbage and waste ma-

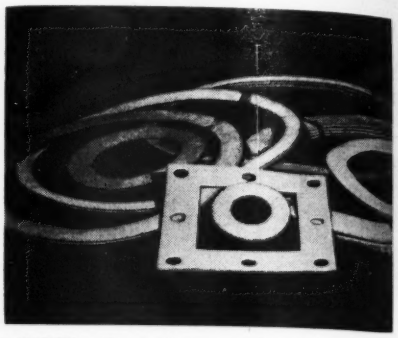


terial. A threefold insulation system that keeps the heat within the incinerator consists of insulating material within the case, a 2-in. circulating air space, and a 2-in. refractory lining.

The burner is automatically ignited and a clock which may be preset will control the burner and stop the flame when the time has expired. The sliding feed door turns off the jet flame of the burner when the door is opened and raises or lowers the draft door.

Gaskets

LAWTON H. PARSONS, 6 S. Main St., Ambler, Pa.



MODEL: Pars asbestos gaskets.

APPLICATION: Designed for use on rough or uneven surfaces subject to considerable expansion and contraction. They are used to hold steam, air, water, ammonia, and other acid and alkali chemicals in storage tanks, cookers, dryers, laundry machines, and boilers.

DESCRIPTION: On standard sizes, flanges are 3/16 in. thick and 7/16 in. wide or larger. Inside diameters are from 2½ to 18 in. Customer specifications will be met for irregular shapes, bolt holes, etc.

Other New Developments

A new straight tube cleaner for process and refinery heat exchangers is claimed by the manufacturer, Thomas C. Wilson Inc., 21-11 44th Ave., Long Island City, N.Y., to be the fastest and most economical tube cleaner on the market. The 15-lb model TP-301 removes deposits from plugged tubes and scavenges them with air or water while cleaning . . . Parlam Corp., 336 Canal St., New York 13, has announced a line of equipment for the process industries, manufactured from a corrosion-resistant carbon and graphite material with unusual properties of refractoriness and controllable thermal conductivity. Equipment currently available includes coolers, heat exchangers, evaporators, boilers, scrubbing towers, tower-packing, tank linings and tiles, and fume ducts. Pumps and ejectors are being developed . . .

Self-adhesive Quik-Label safety signs produced by W. H. Brady Co., Dept. 208, Chippewa Falls, Wis., are printed on extra strength cotton cloth and coated with silicone plastic for protection from dirt and moisture. They are mounted on dispenser cards. More than 550 safety signs and pipe markers are carried in stock . . . General Air Conditioning Corp., 4542 E. Dunham St., Los Angeles 23, is producing two kitchen "packages" designed for apartments, motels, offices, etc. The 27½-in. wide unit contains a 4-cu ft refrigerator, storage drawer, a 12 x 16-in. sink, drainboard, and three-burner gas range, and it requires about 4 sq ft of floor space. The other "kitchen" provides a 4-cu ft refrigerator topped with a porcelain sink and drainboard and storage drawer. It is designed for use with a 21-in. apartment range.

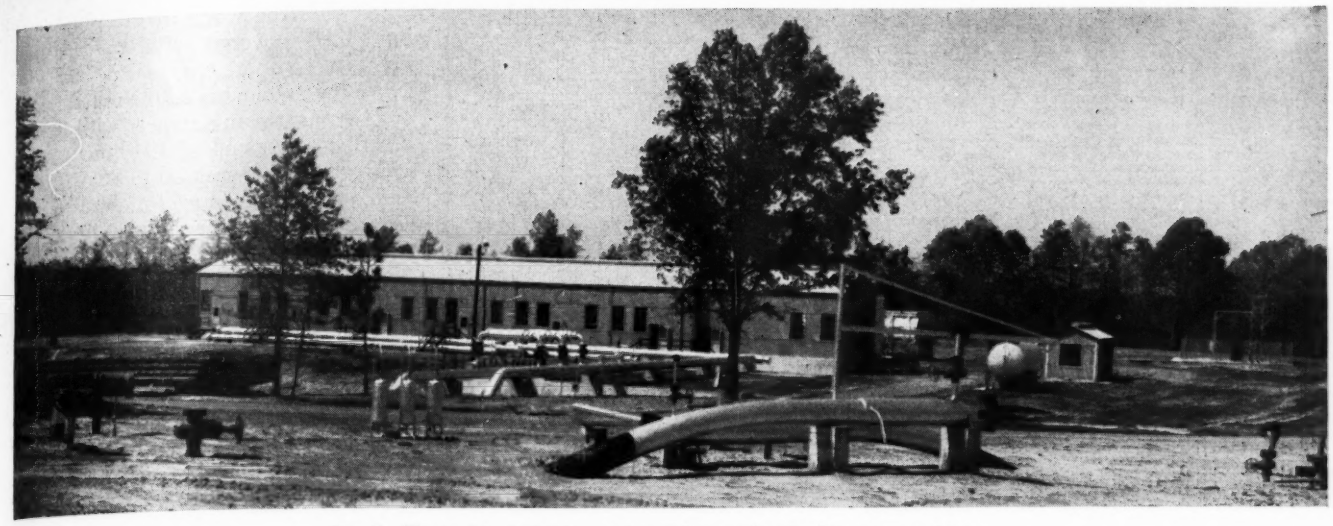


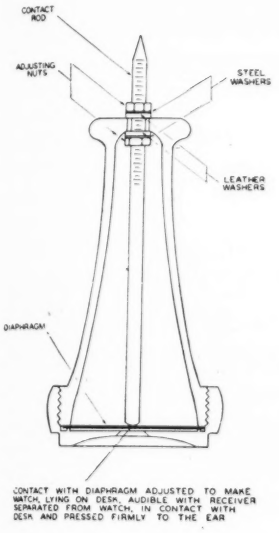
Fig. 2. Typical installation of incoming and outgoing scraper traps.

Continuous Pipeline Cleaning

How efficiency exceeding 90% is maintained on the Big Inch line

By E. R. CUNNINGHAM

Texas Eastern Transmission Corp.


CONTACT ROD
ADJUSTING NUTS
STEEL WASHERS
LEATHER WASHERS
DIAPHRAGM
CONTACT WITH DIAPHRAGM ADJUSTED TO MAKE WATCH, LYING ON DESK, AUDIBLE WITH RECEIVER SEPARATED FROM WATCH, IN CONTACT WITH DESK AND PRESSED FIRMLY TO THE EAR

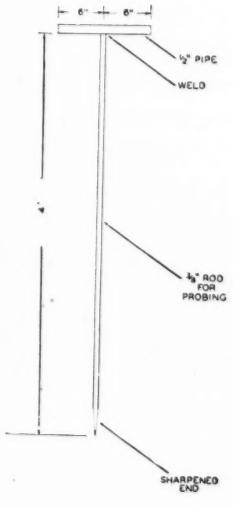


Fig. 1. Listening device made from old-style telephone receiver.

WITH the termination of World War II and the early return of the tankers to coastwise service, the mission of the "Big Inch" and "Little Big Inch" pipelines as war facilities was completed.

Exclusive

The immediate problem created by the shutdown order was to devise a method of displacing the approximately 3,640,000 bbls of crude oil in the 24-in. line and the approximately 2,840,000 bbls of refined products in the 20-in. line. In addition some substance, either gaseous or liquid, had to be found that would be reasonably priced, readily available in large quantities, non-corrosive, non-explosive, and suitable to leave in the pipelines under pressure after the oil and water were displaced.

The method used to accomplish this was to displace all of the crude and products in the pipelines with treated water to prevent internal corrosion of the pipe. The water was then displaced with pure nitrogen purchased from the Mathison Alkali Co.'s plant near Lake Charles, La. Completion date for the displacement of the water with nitrogen was December 1945, at which time the pressure on the nitrogen was built up to approximately 50 psig over the entire system. The pressure held without additional nitrogen being added until the line was put into operation as a gas carrier. This conclusively demonstrated that the pipelines had no leaks.

On May 1, 1947, Texas Eastern Transmission Corp. took possession of the pipelines and immediately thereafter checked the efficiency of the system and found that it was operating at 67% based on the Panhandle formula. We began covering the lines to locate the cause of the low efficiency and found, as could be expected, that all of the treated water and some of the products had not been removed from the lines by the running of the internal plugs with the nitrogen. We immediately put crews on the lines for the purpose of locating and removing the fluids which in some instances had collected in considerable quantities in low spots in the lines.

Each of the crews was equipped with a listening device which was made from an old-style telephone receiver *(Fig. 1)* in connection with a sounding rod which was pushed firmly against the top of the pipe. By placing the point of the contact rod on the receiver against the top of the sounding rod, one could hear the fluid being agitated by the flow of the gas. At such points the pipe was hot-tapped and the liquid removed from the line.

A total of 11,930 bbls of liquid was removed by this method in the first eight months of operation which increased the overall efficiency from 67% to 79.6%. This efficiency indicated that

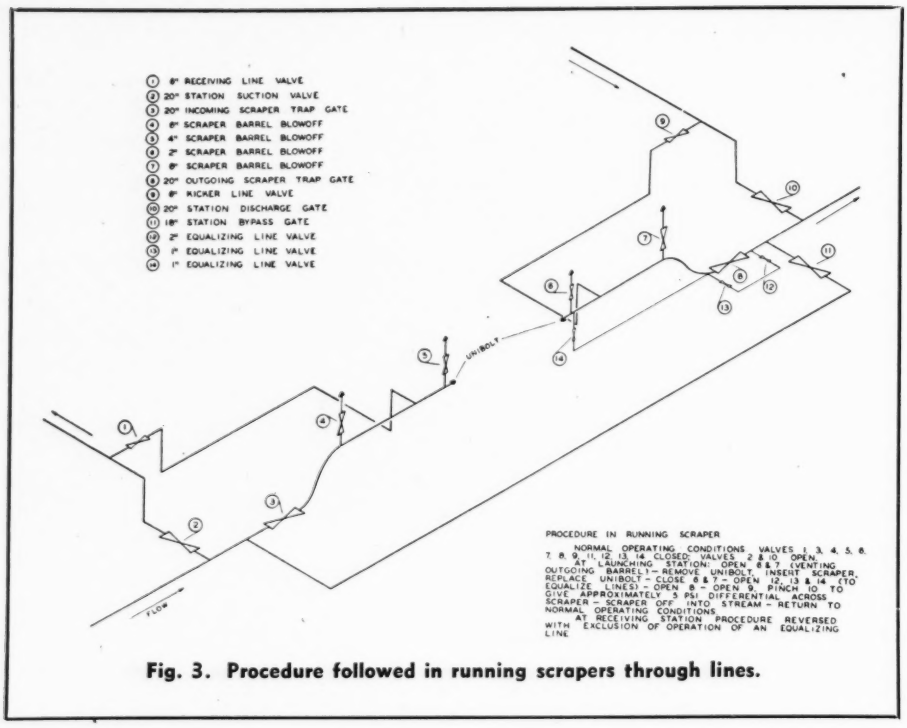

① 8" RECEIVING LINE VALVE
② 20" STATION SUCTION VALVE
③ 20" INCOMING SCRAPER TRAP GATE
④ 8" SCRAPER BARREL BLOWOFF
⑤ 4" SCRAPER BARREL BLOWOFF
⑥ 2" SCRAPER BARREL BLOWOFF
⑦ 8" SCRAPER BARREL BLOWOFF
⑧ 20" OUTGOING SCRAPER TRAP GATE
⑨ 8" KICKER LINE VALVE
⑩ 20" STATION DISCHARGE GATE
⑪ 18" STATION BYPASS GATE
⑫ 2" EQUALIZING LINE VALVE
⑬ 1" EQUALIZING LINE VALVE
⑭ 1" EQUALIZING LINE VALVE
UNIBOLT
FLOW
PROCEDURE IN RUNNING SCRAPER
NORMAL OPERATING CONDITIONS VALVES 1, 3, 4, 5, 6, 7, 8, 9, 11, 12, 13, 14 CLOSED; VALVES 2 & 10 OPEN.
AT LAUNCHING STATION: OPEN 6 & 7 (VENTING OUTGOING BARREL) – REMOVE UNIBOLT, INSERT SCRAPER, REPLACE UNIBOLT – CLOSE 6 & 7 – OPEN 12, 13 & 14 (TO EQUALIZE LINES) – OPEN 8 – OPEN 9. PINCH 10 TO GIVE APPROXIMATELY 5 PSI DIFFERENTIAL ACROSS SCRAPER – SCRAPER OFF INTO STREAM – RETURN TO NORMAL OPERATING CONDITIONS.
AT RECEIVING STATION PROCEDURE REVERSED WITH EXCLUSION OF OPERATION OF AN EQUALIZING LINE

Fig. 3. Procedure followed in running scrapers through lines.

Fig. 4. Two views of the Unibolt, closing device used for insertion and removal of pigs.

it would be necessary to clean the walls of the pipe. A careful inspection was made of the inside wall of the pipe whenever it was necessary to cut the line, and it was found that we had varying quantities of solid substances such as heavy jellied asphaltic substance, paraffin, and mill scale on the bottom and walls of the pipe.

Since these lines were designed to carry oil and oil products, scraper traps *(Fig. 2)* were installed at each of the stations, which were approximately 50 miles apart, thus allowing the scrapers to be run on stream with the oil. It was suggested by the employees who had formerly worked for WEP that scrapers be run on stream with the gas. There was considerable question as to whether this should be attempted until the lines had been cleaned to atmosphere because (1) the length of the runs would necessarily be approximately 50 miles, (2) former experiences on shorter sections indicated that scrapers run in dry lines without the benefit of the lubricant of liquids would be completely worn out on a run of this length, and (3) if the lines were dry the amount of dust and mill scale entrained in the gas would severely damage any mechanical equipment through which it passed, and would also create a considerable amount of trouble if delivered into a distribution system.

A test run was made in May 1948 in a section of line known to have some fluids remaining. The recovery from this run produced 15 bbls of oil and water and 1 gal. of mill scale. A second experimental run was made on a section that was approximately dry and removed only 2 gals. of mill scale; however, a considerable quantity was vented out to the atmosphere just ahead of the scraper.

We cleaned four sections by the conventional method of cutting the pipe and lifting it and running the scraper to the atmosphere. In the supply section nearest the field where the dry gas was brought into the line, a large amount of dirt and mill scale was removed in the form of dust. The farther we got from the field, the less dust was encountered and the more moisture was in the line. On the fourth run it was found that the walls of the pipe were completely covered with an oily film when the scrapers came out.

We then commenced the regular running of on-stream scrapers with the result that at the end of 1948 our overall efficiency had increased to 86.4%. *Fig. 3* shows the procedure followed in running the scrapers through the lines. The "Unibolts" referred to in this drawing are shown in detail in *Fig. 4*.

Fig. 5 shows the monthly overall efficiency from May, 1947, through December, 1950. The straight lines shown on this curve were made during periods when new compressor stations were being connected to the system and other rearrangements on the system were being made. No true efficiency calculations could be made because of the variations in volumes of gas passing through the line.

On the open end runs we first ran through the lines a plough type scraper *(Fig. 6)* designed to scrape the walls of the pipe. However, it was found that due to the numerous scrapers run through the lines during oil operations, there was no large accumulation of foreign matter on the walls of the pipe which would require this type of scraper to break it loose.

We then began running the same type scrapers *(Fig. 7)* as were used during the WEP days. They were so designed that we could use alternate brushes and

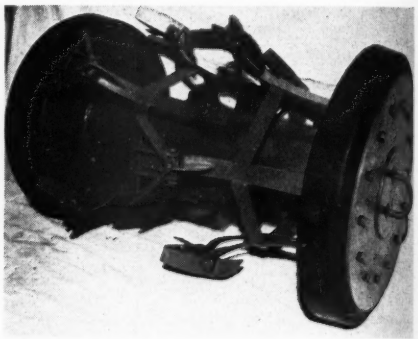


Fig. 6. Plough-type scraper designed to clean pipe walls.

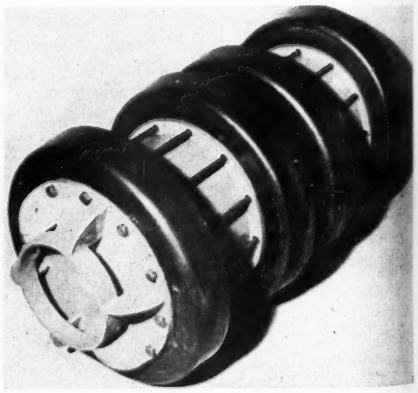


Fig. 7. Scraper equipped with rubber cups only.

TABLE 1. Scraper Miles

	Scrapers Run	Miles
1948	283	13,884
1949	938	43,102
1950	422	24,767
Total	1643	81,753

rubber cups which did a combination job of brushing the walls and pushing the foreign matter ahead of the scraper. With this combination, we found that it was best to first run scrapers completely made up of rubber cups to remove the entrained fluids which were later followed by the combination brush and rubber scraper.

In checking the latter type scraper after a run it was found that because of the weight of the scraper itself, plus the long distance that it traveled, one scraper was only good for about 100 miles. In addition, at the beginning of the run all of the top as well as the bottom side of the pipe was being properly cleaned while at the end of the run the top portion of the pipe was not properly cleaned.

We then began experimenting with a scraper *(Fig. 8)* with the brush mounted on springs which held it against the walls of the pipe on top as well as on the bottom, resulting in complete cleaning action through the entire section of the line. Because we were getting even wear on both the rubber cups and brushes, this type of scraper could be run more than 300 miles.

Table 1 shows the number of scrapers run and the number of scraper miles run by years.

It might be added at this point that it is necessary for us to continue to run scrapers for the purpose of maintaining the efficiency of the lines. The number of runs required has been greatly reduced, however, as we have only had to run 62 scrapers for a total of 4189 miles during the first three months of 1951.

It is interesting to note that with the old type scraper we found it necessary to run as many as 60 scrapers through certain sections to clean them before the 92% efficiency was reached. However, in other sections we ran considerably less. We feel that with the new improved spring-type cleaner the same results can be obtained with at least one-third less cleaners.

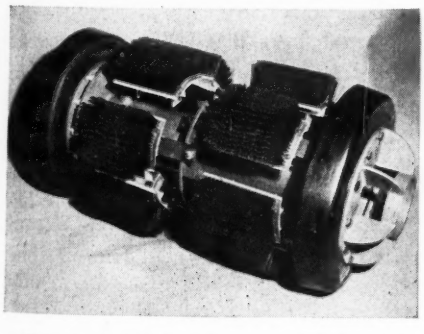


Fig. 8. Expansion scraper with brush mounted on springs.

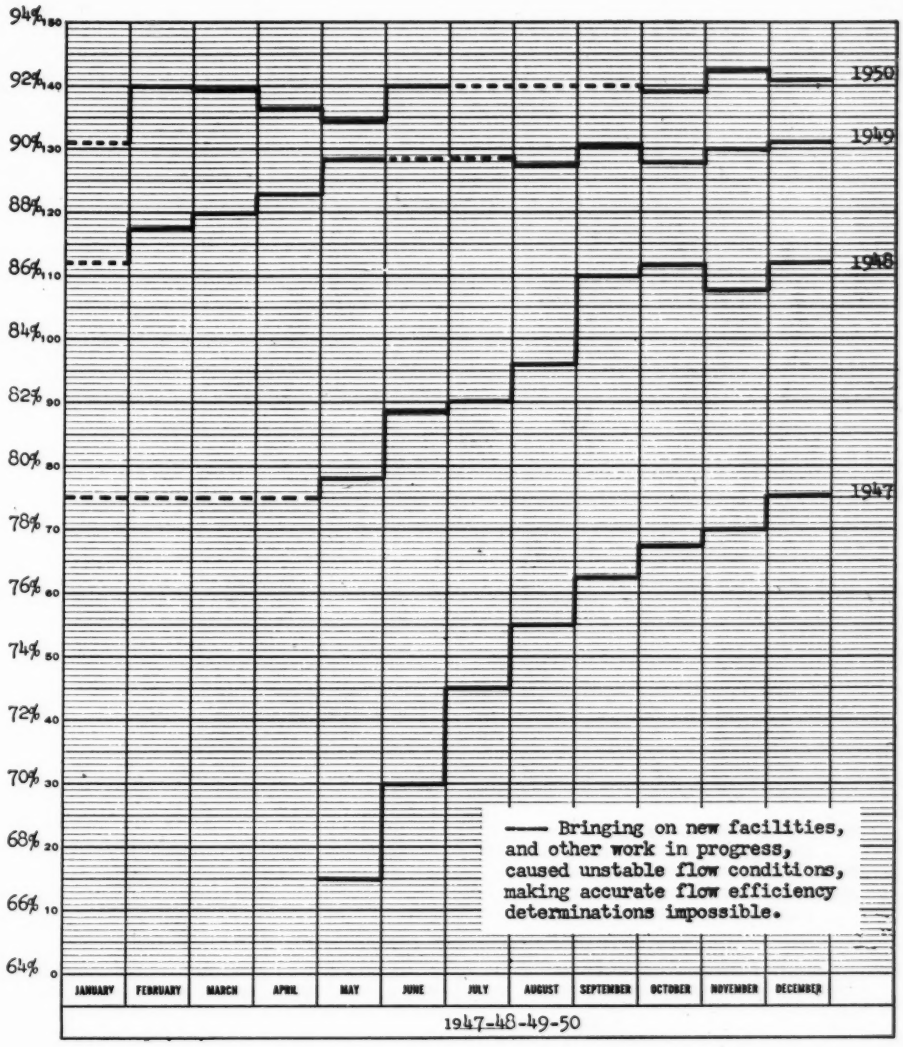


Fig. 5. Monthly overall efficiency, May 1947 through December 1950.

We have also had demonstrated to us, as indicated on the efficiency graph for March, April, and May of 1950, that without continuous running of scrapers in a line the efficiency will continually decrease because (1) gas cannot be compressed without a small carry-over of lubricating oil, and (2) during the winter months when the ground temperature is low, a considerable quantity of carbohydrates entrained in the gas will fall out in the line thus creating an excess pressure drop at the very time when the full efficiency is most needed. We keep a continuous check on our system and if the efficiency between any two stations decreases, we immediately insert a scraper and the efficiency is restored.

We are continually getting inquiries concerning the cost of the scraper traps. This can only be answered if the type and size of the equipment intended to be installed is furnished. The total cost of running scrapers on our system in lines ranging from 8 in. to 26 in. has been approximately $2 per mile, and the loss of gas for such operation is practically nothing.

The best method to use in determining whether it would be economical to clean a system with the running of these scrapers is to first take the total investment against the designed capacity of the lines and find out what has been spent for each million cubic feet of capacity. Then compare present efficiency with the expected efficiency and determine how much looping would be required to bring the efficiency up to that for which the line was designed, or take the value of the gas which cannot be delivered because of the inefficiency of a line and determine what the earnings would have been on the difference.

We have received numerous inquiries as to whether such onstream runs can be made in old lines. It is our thought that any line that has full opening valves can be equipped with scraper traps and cleaned as well as new lines designed for this type operation.

PUMPING GAS WITH GAS TURBINES

Equipment selection and design considerations in the building of a centrifugal compressor station

By J. F. EICHELMANN and J. S. QUILL

In order to increase the delivery capacity of its Texas-to-California line to more than 1 billion cu ft per day, El Paso Natural Gas Co. is undertaking the first large-scale installation of gas turbine-driven centrifugal compressor stations for natural gas service.

THE part of the El Paso Natural Gas Co. pipeline system on which the installations will be made extends from the west Texas-New Mexico border to the California border and consists of a 26- and 30-in. pipe in parallel as shown in *Fig. 1*.

The delivery capacity of this line at the present time is approximately 755 million standard cubic feet per day (MMscf/d*) and this is to be increased to approximately 855 MMscf/d in the immediate future and later to 1055 MMscf/d. The line operates at a maximum pressure of 838 psia.

Cost of Looping

In order to find out whether it is more economical to install booster stations or to loop the line, let us consider a section of the El Paso line, 200 miles in length, with a delivery capacity of 760 MMscf/d with 20,000 hp reciprocating compressor stations located 100 miles apart. For small increments of flow only part of the line is looped, the length of loop being that required by the flow when a compression ratio of 1.5 is maintained at the compressor stations. The horsepower of the compressor station is then increased as required.

In comparison, we substitute the loop requirements with intermediate booster stations. The results of the comparison, *Fig. 2*, show that centrifugal booster stations are more economical for approximately 300 MMscf/d of additional flow, and that looping is less expensive for larger flow.

El Paso Natural will install seven 5000-hp gas turbine-driven centrifugal compressor stations for the first 100 MMscf/d increase in delivery capacity of the line and 18 additional units for the future 200 MMscf/d increase.

*A standard cubic foot is taken at 14.9 psia and 60°F.

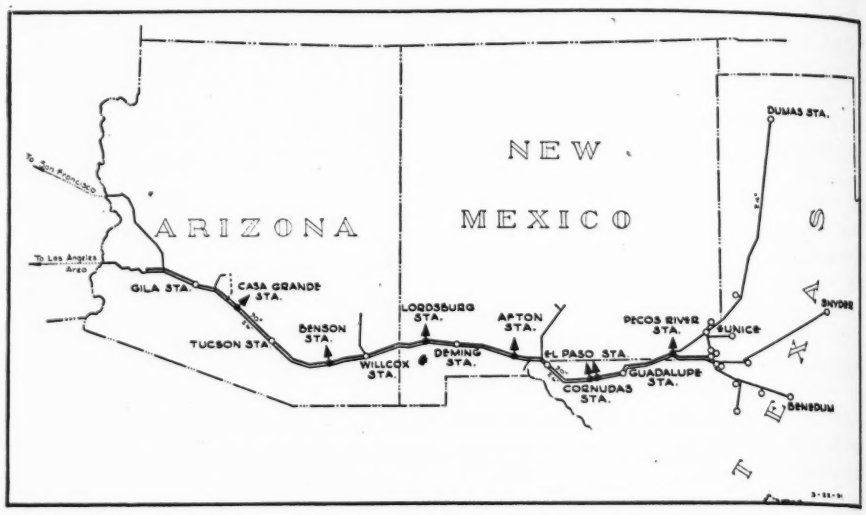


Fig. 1. Proposed gas-turbine booster stations on El Paso Natural system.

Why Gas Turbine?

The decision to install gas turbine-centrifugal compressor stations was based on the following considerations:

1. *Highly Efficient at Low Compression Ratio.* Gas turbine-centrifugal compressors are ideal for booster stations. For example, the 5000-hp booster stations for El Paso are designed for flows ranging from 1200 to 800 MMscf/d and compression ratios from 1.10 to 1.16. At these low compression ratios, centrifugal compressors are considerably more efficient than reciprocating compressors. This results from the fact that the entering and leaving losses of a reciprocating compressor become a significant portion of the useful horsepower. Booster station horsepower can be reduced by as much as 20% at low compression ratios by installing centrifugal compressors.

Fig. 3 shows the brake horsepower per million vs. compression ratio for both reciprocating and centrifugal compressors.

Less horsepower has to be installed and less fuel gas consumed when the gas is given small boosts in pressure at more frequent intervals. A small pressure boost does not require aftercooling and this saves on installed cost and maintenance.

2. *Saves Money.* The basic data for making an economic comparison between reciprocating gas engines and gas turbines are shown in *Table 1*. The values in *Table 1* are those frequently

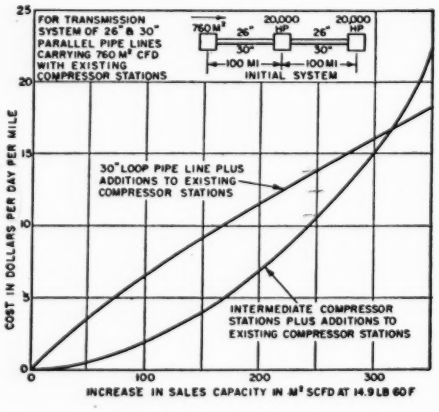

FOR TRANSMISSION SYSTEM OF 26" & 30" PARALLEL PIPE LINES CARRYING 760 M³ CFD WITH EXISTING COMPRESSOR STATIONS
760 M³
26"
20,000 HP
30"
INITIAL SYSTEM
100 MI
30" LOOP PIPE LINE PLUS ADDITIONS TO EXISTING COMPRESSOR STATIONS
INTERMEDIATE COMPRESSOR STATIONS PLUS ADDITIONS TO EXISTING COMPRESSOR STATIONS
COST IN DOLLARS PER DAY PER MILE
INCREASE IN SALES CAPACITY IN M³ SCFD AT 14.9 LB 60 F

Fig. 2. Relative cost of increasing sales capacity by looping the line and by intermediate compressor stations.

Mr. Eichelmann is chief engineer for El Paso Natural and Mr. Quill is application engineer, industrial engineering division, for General Electric Co. at Schenectady, N. Y. This paper was originally presented at the AGA Natural Gas Dept. spring meeting in Dallas, May 7-8.

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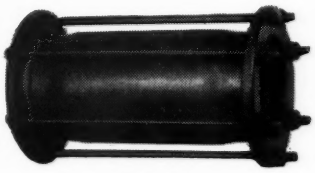

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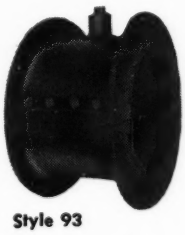

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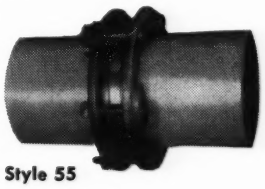

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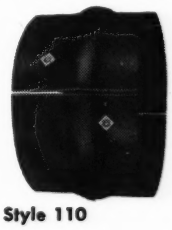

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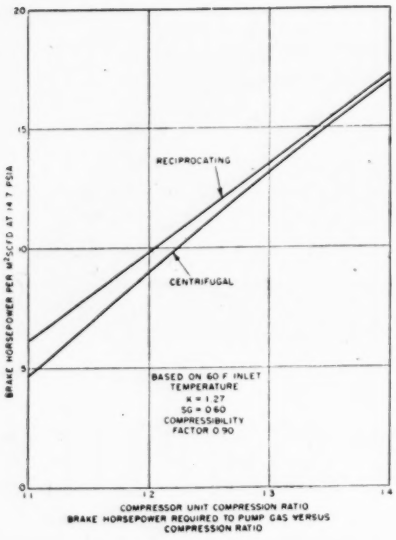

RECIPROCATING
CENTRIFUGAL
BASED ON 60 F INLET TEMPERATURE
K = 1.27
SG = 0.60
COMPRESSIBILITY FACTOR 0.90
BRAKE HORSEPOWER PER M³/SCFD AT 14.7 PSIA
COMPRESSOR UNIT COMPRESSION RATIO
BRAKE HORSEPOWER REQUIRED TO PUMP GAS VERSUS COMPRESSION RATIO

Fig. 3. Brake horsepower per million vs. compression ratio.

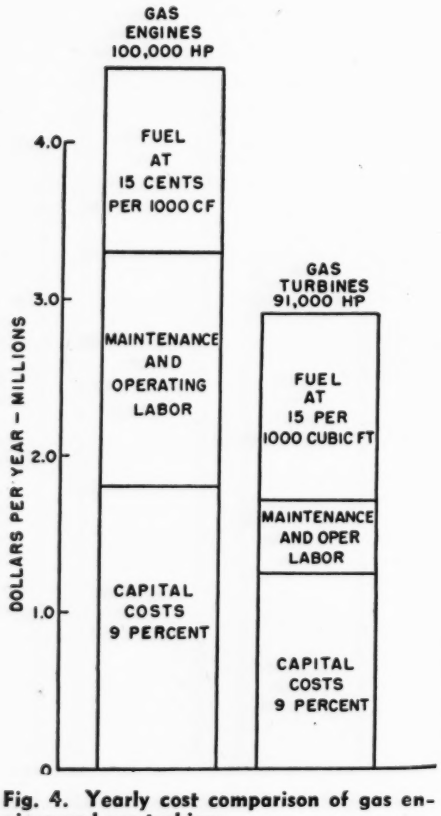

GAS ENGINES 100,000 HP
FUEL AT 15 CENTS PER 1000 CF
MAINTENANCE AND OPERATING LABOR
CAPITAL COSTS 9 PERCENT
GAS TURBINES 91,000 HP
FUEL AT 15 PER 1000 CUBIC FT
MAINTENANCE AND OPER LABOR
CAPITAL COSTS 9 PERCENT
DOLLARS PER YEAR – MILLIONS

Fig. 4. Yearly cost comparison of gas engines and gas turbines.

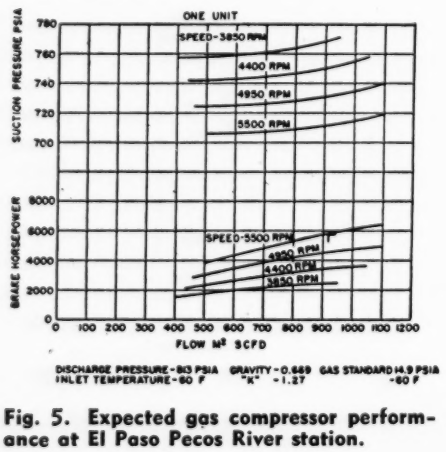


Fig. 5. Expected gas compressor performance at El Paso Pecos River station.

used in the gas pipeline industry. If more accurate figures for particular cases are available, they may be inserted and the results modified accordingly.

For purposes of comparison, a line is assumed to require 100,000 hp of reciprocating gas engine compressors. When the compression ratio of the stations is low, say 1.20, as in the case of a 10,000-hp station for El Paso, the reciprocating stations require approximately 9.8 bhp per million cu ft while the centrifugal stations require only 9 bhp per million cu ft for the same pressure boost.

Yearly Costs

Thus, it requires 91,000 hp of centrifugal compressors to pump the same amount of gas that 100,000 hp of reciprocating compressors will pump at the same compression ratio. The results of the economic comparison, *Fig. 4*, indicate that with gas engines the total yearly costs are $4.48 million; with the gas turbines the total yearly costs are $2.89 million. The same amount of gas is pumped in either case.

Not evaluated, but distinctly in favor of the gas turbine, is the 25% additional horsepower available in the wintertime, as pointed out below.

3. *Requires No Water.* The gas turbine station can be operated in the middle of the desert with no cooling water required except to replace very small losses in the recirculating coil cooling water system. The heat from the lubricating oil is removed by air-blown radiators. Where a small quantity of water is available, additional horsepower output can be obtained by washing and precooling the incoming air.

4. *Generates Its Own Auxiliary Power.* The gas turbine pumping unit is a complete self-contained plant and includes a turbine-driven a-c generator. No additional electric power need be purchased or generated in the station while the gas turbine is running.

5. *Provides Additional Horsepower in the Winter.* In the winter, when demand for gas is the greatest, the gas turbine will deliver approximately 25% more power than its nominal 80° F rating because ambient temperatures are lower. A fundamental characteristic of gas turbines is that they can deliver increasing amounts of power as ambient temperatures decrease. Some surplus power will be available from the gas turbine much of the time because the average temperature in most locations is below 80° F, the ambient temperature on which its rating is based.

6. *Provides Flexibility.* Its adjustable speed characteristics can take care of the variable flow and pressure ratio requirements.

7. *Requires Little Lubricating Oil.* The lubricating oil consumption requirements of a 5000-hp gas turbine station are estimated to be less than 1 gals. per month.

8. *Does Not Require Station Attendants.* The gas turbine is a simple rotating machine, completely automatic in its starting and stopping.

Temperatures, lubricating oil pressures, over-speed, vibration, etc. are continuously checked with automatic devices.

These inherent features require a minimum of attendance. It is expected that the El Paso stations, when first installed, will be operated with one man per shift, or a total of five men per station.

Dispatcher to Operate

At some time in the future, it is expected that they will be operated by the dispatcher located in El Paso. Provisions are made so that the units can be started, stopped, speed adjusted, and pressures read from the remote location over the planned microwave communication system.

TABLE 1. Yearly Operating Costs of Gas Turbine and Reciprocating Gas Engine Stations

	Gas Engine Standard Type		Gas Turbine With Regenerator 80°F	
Bhp installed	100,000		91,000	
Cost per installed hp	200		150	
Station cost	20,000,000		13,650,000	
Yearly capital costs at 9%		1,800,000		1,230,000
Yearly operating and maintenance labor, cost per hp	15		5	
Yearly operating and maintenance labor, cost per year		1,500,000		455,000
Total station fuel consumption, including auxiliaries, cu ft/bhp hr	9		10	
Yearly fuel costs $0.15/Mcf 1.0 capacity factor, cost per year		1,180,000		1,200,000
Total yearly operating costs		4,480,000		2,885,000

Centrifugal compressors manufactured by Clark Brothers Inc., De Laval Steam Turbine Co., and Ingersoll Rand Co. will be installed in the stations. These centrifugal compressors are directly driven by the gas turbine output shaft. All compressors are single stage and approximately 82% efficient at rate load. A typical centrifugal compressor characteristic is shown in *Fig. 5*. All of the casings, with impeller changes, are designed to take a future flow of 1100 million.

Description of Turbine

The gas turbine to be installed on the El Paso Natural Gas system was especially designed by the General Electric Co. for gas pipeline pumping. The rating of the gas turbine is 5000 hp, 5000 rpm, 80° F, 1000-ft altitude, 25% thermal efficiency based on lower heating value of the fuel. The altitude correction factor curve is shown in *Fig. 6*.

The flow diagram of the pipeline gas turbine is shown in *Fig. 7*. The special features that make this turbine particularly desirable for pipeline pumping are these:

1. The turbine portion is broken into two sections, each driving a separate shaft, one for the axial air compressor and the other to drive the load. With this arrangement, constant horsepower output over a wide range of speed on the load compressor can be obtained by running the axial air compressor shaft at different speeds.
2. A regenerator has been added to recover and utilize heat that would otherwise be wasted in the exhaust, thus resulting in a higher thermal efficiency.

Operating Lines

Fig. 8 shows the operating limits of horsepower as a function of speed for various ambients. For a given ambient, it is possible to operate at any load up to the limit shown on the curve over the speed range from 2000 to 5500 rpm.

Since the horsepower characteristic of the gas turbine is very flat in the vicinity of 5000 hp (the rating of the turbine), the compressor can be selected to deliver approximately 5000 hp at any speed ranging from, say, 4000 to 5500 rpm. By selecting a compressor to develop 5000 hp at 4500 rpm, the compressor can be speeded up in the wintertime to absorb 6300 hp available from the gas turbine at 40° F ambient.

The 80° F fuel consumption at various loads is superimposed on *Fig. 8*. The full load fuel consumption is 10 cu ft per brake horsepower hour of fuel having a lower heating value of 1020 Btu per cu ft.

The effect of ambient on load limit is also shown on *Fig. 8*. The turbine develops its full rating, 5000 hp, at 80° F ambient, and when the ambient is 40° F, the unit will develop approximately 6300 hp or 25% above rated load.

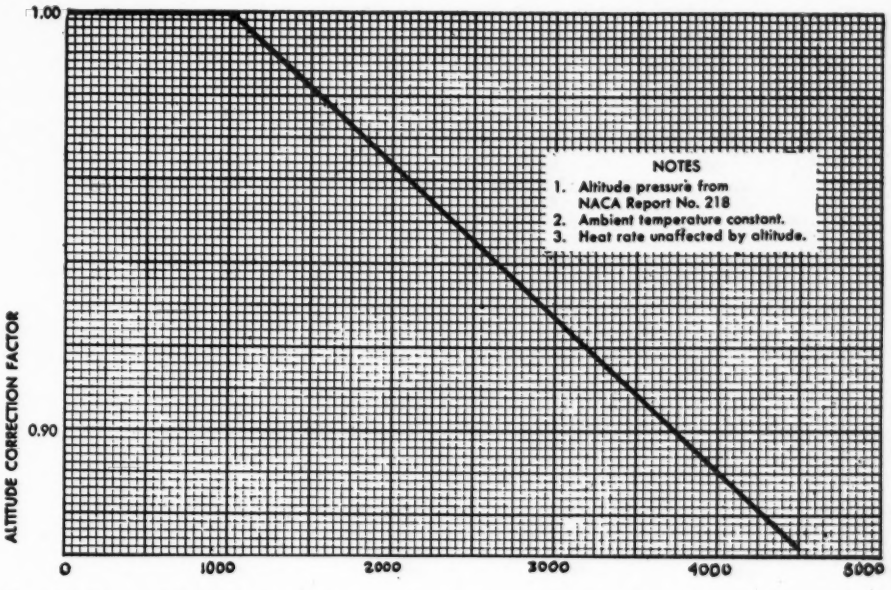


Fig. 6. Gas turbine power plant altitude correction factor curve for output and heat consumption vs. altitude in feet.

A cross section of the turbine is shown in *Fig. 9*. The ducts going to and returning from the heat exchanger are shown, although the heat exchanger itself is not shown. The fact that the load shaft is independent does not make much difference in exterior appearance since both turbine wheels are enclosed in the same housing.

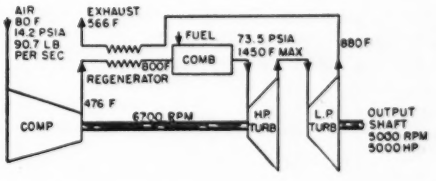


Fig. 7. Schematic diagram of 3500-kw, 5000-hp regenerative cycle gas turbine.

Description of Station

The plan and cross section of a two-unit, 10,000-hp gas turbine compressor station are shown in *Fig. 10*. The building is relatively small in size, 50 ft x 50 ft x 40 ft, or approximately 10 cu ft per hp. The disassembly area will permit bringing in a complete power plant and putting it on location with a crane; thus saving installing time and expense. The light weight of the power plant—45,000 lb—makes this possible.

The regenerator is a shell and straight-tube type of heat exchanger, the shell being the high pressure side. The shell is fabricated from boiler plates and the tubes are rolled and butt welded from carbon steel material. The regenerator which forms the base of the exhaust stack is 10 ft in diameter, 28 ft long, and contains approximately 5000 1¼-in. OD tubes.

The evaporator cooler air filter is dual purpose equipment. Its primary function is to lower the temperature of the intake air during high ambient operation. For example, on a 100° F, 20% relative humidity day, the effective ambient is approximately 69° wet bulb temperature for that day. Under these conditions, the summertime output can be increased by more than 15% by evaporated cooling. Two sets of sprays are located in the evaporator cooler, one for evaporation and one for continuous wash down of the filter equipment. The tank is built into the base of the equipment for water storage.

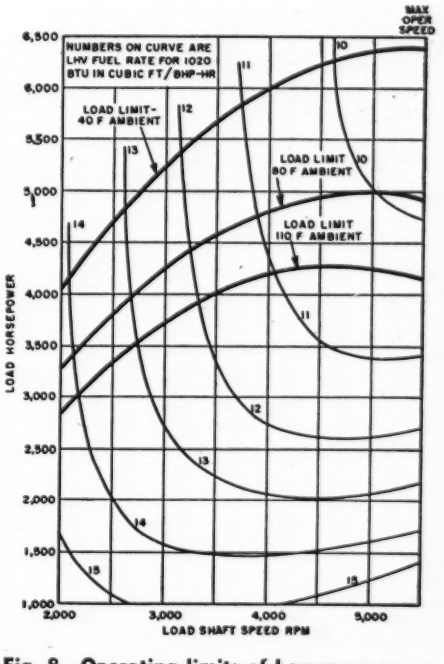


Fig. 8. Operating limits of horsepower as a function of speed for various ambients as applied to a 5000-hp, two-shaft gas turbine with regenerator with 25% thermal efficiency at 80°F, 1000-ft altitude, 5000 hp, 5000 rpm hp vs. speed with load limits and lhv fuel.

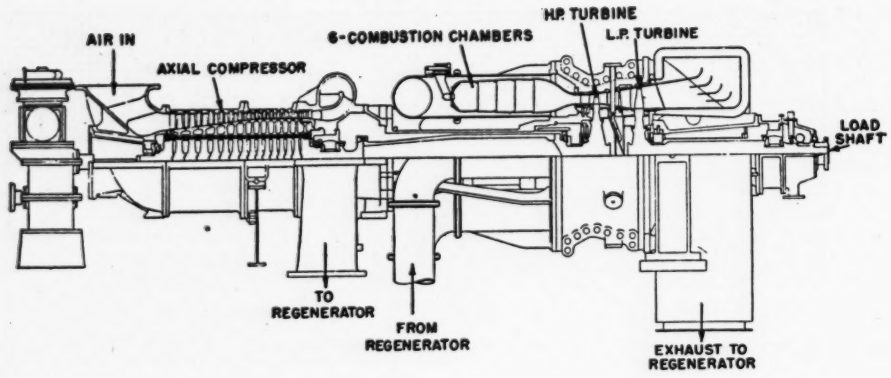


Fig. 9. Cross section of gas turbine showing ducts to and from the heat exchanger.

Only about 15 gpm are required for such operation.

Auxiliary Power

Four sources of auxiliary power are provided in the station. A 150-lb air supply system is used for instruments and miscellaneous valve operation. A 125-volt d-c station battery is used for control power, ignition, emergency lights, and for supplying lubricating oil pressure during starting and stopping. A 75-kw generator gear driven from the gas turbine provides the auxiliary power for all motors in the station during the operation of the gas turbine. A small gas engine-driven generator provides a-c power in the station for charging the station battery when the gas turbines are shut down.

The major auxiliaries consist of the following:

(a) Gas Turbine Auxiliaries
- 1—1.5-hp a-c cooling water pump (cooling of gas turbine parts)
- 2—3-hp d-c lubricating oil pumps (used during starting and stopping only)
- 1—1-hp d-c cooling water pump (standby for above; used during starting and stopping)

(b) Centrifugal Compressor Auxiliaries
- 1—7.5-hp a-c seal oil pump (standby to shaft-driven pump)

(c) Evaporative Cooler
- 1—10-hp a-c spray pump for evaporation
- 1—15-hp a-c water pump for filter wash

(d) Station Auxiliaries
- 1—7½-hp a-c water pump for lubricating oil coolers
- 1—15-hp a-c cooler pump for fin-fan blowers
- 1—7½-hp air compressor
- 2—2-hp a-c vent fans for turbine room
- 1—Feeder for 15-gpm water supply system

The water requirements of the station are relatively small because it is expected that aftercooling of the pipeline gas will not be required.

Lubricating Oil System

A common lubricating oil system is used for both the gas turbine and centrifugal compressor. The oil supply consists of an 850-gal. tank located beneath the starting turbine. The main turbine lubricating oil pump is gear driven from the turbine. This is supplemented by two d-c pumps for use during starting and stopping.

The centrifugal compressor high pressure seal oil pump is gear driven from the centrifugal compressor and an a-c high pressure standby seal oil pump is also provided.

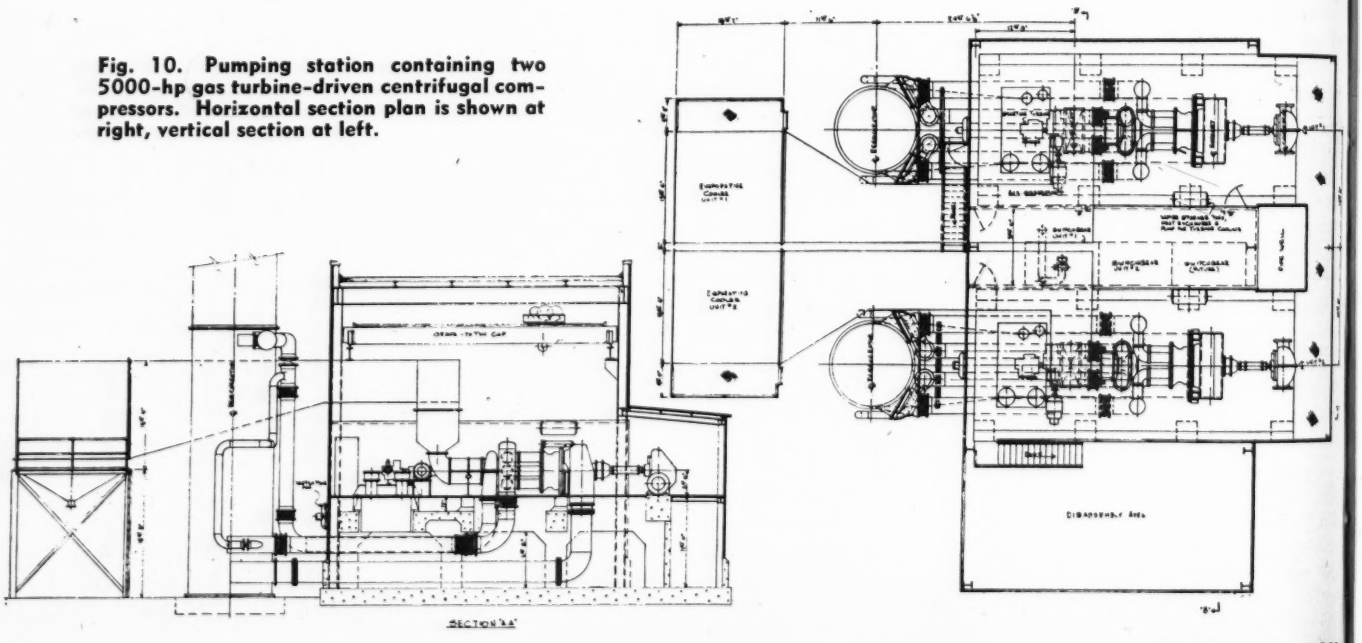
The lubricating oil temperature of 130° F is maintained by circulating 225 gpm of 115° F cooling water in the oil coolers with a 5° rise in the cooling water. The tube material is arsenical admiralty metal and two oil coolers are used, one of which is a spare. With a recirculating water system between the coolers and the fin-fan radiators, the design is conservative.

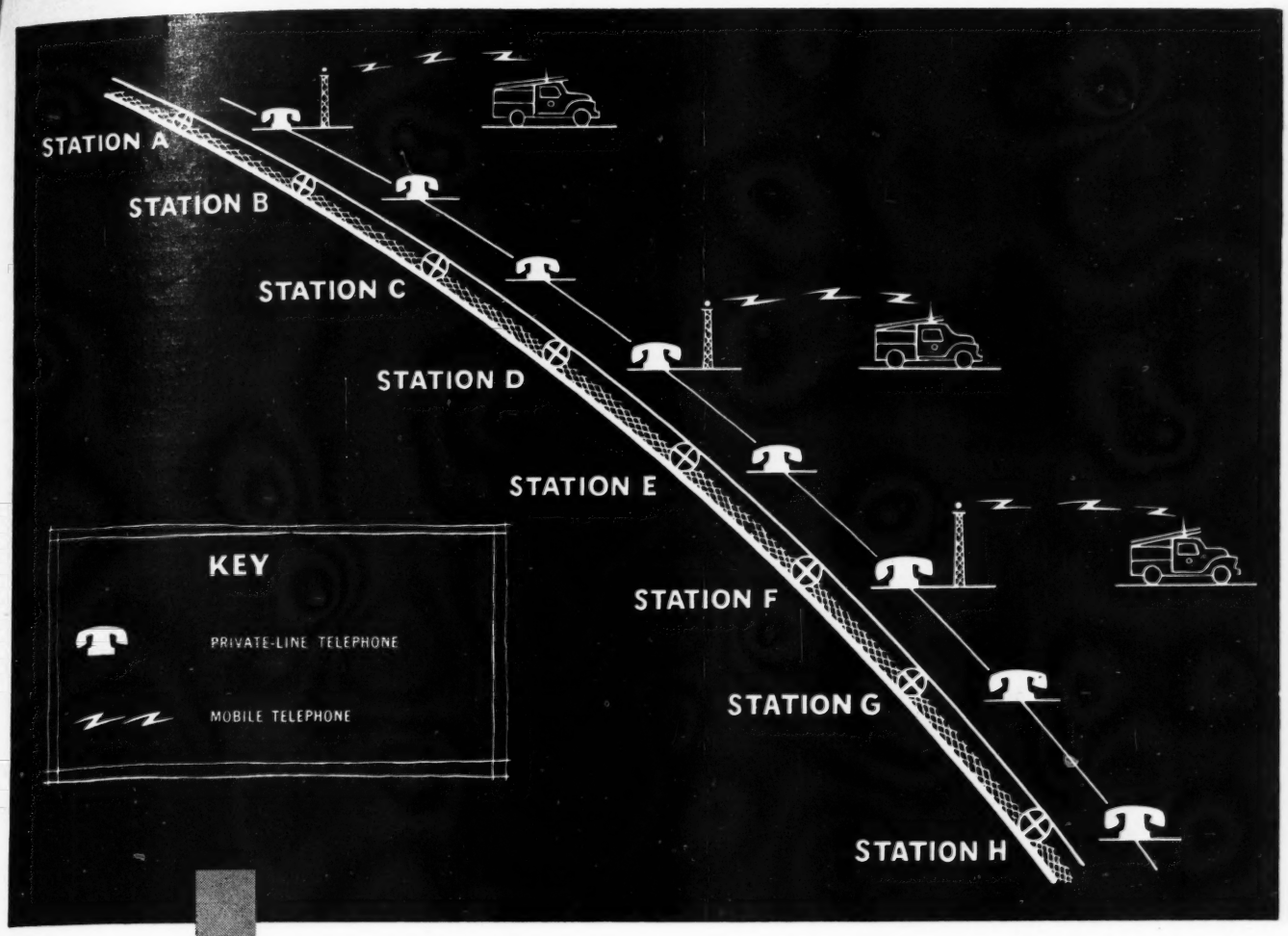
Starting

The gas turbine is started by means of a mechanical drive turbine operating from gas line pressure. It is not expected that frequent starting will be necessary, and the 35,000 cu ft of gas used for each start is justified by the increased reliability of this starting means over any other method. The expanded gas is exhausted to atmosphere.

The starting is completely automatic. When the master switch is placed in the "on" position, the d-c lubricating oil and cooling water pumps are started. When the d-c pumps have filled the compressor overhead seal oil tank, the starting turbine brings the gas turbine up to 10% speed where the turbine system is purged for three minutes. The turbine is now fired and accelerated to 60% idling speed where the a-c auxil-

Fig. 10. Pumping station containing two 5000-hp gas turbine-driven centrifugal compressors. Horizontal section plan is shown at right, vertical section at left.





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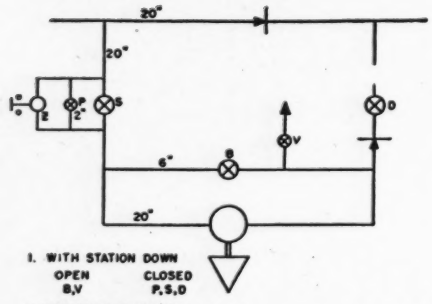

20"
20"
6"
20"
1. WITH STATION DOWN
OPEN
B,V
CLOSED
P,S,D
2. STARTING SEQUENCE
(a) B CLOSES AT 10 PERCENT N
(b) P OPENS WHEN GAS TURBINE FIRES
(c) V CLOSES 5 SEC AFTER TURBINE FIRES
(d) S AND D OPEN WHEN 2 INDICATES ZERO DIFF PRESS.
3. STOPPING SEQUENCE
(a) B OPENS WHEN STOPPING SIGNAL IS GIVEN
(b) S,D,P CLOSE A FEW SECONDS LATER
(c) V OPENS WHEN LOAD SHAFT COASTS TO 25 PERCENT N

Fig. 11. Gas valve sequencing in a gas turbine pipeline pumping station.

iaries are started and the starting sequence is completed.

Stopping

When the stopping signal is given, the fuel is stopped, the regenerator is bypassed, and the main suction and discharge gas valves are closed. The load turbine shaft is expected to come to rest in approximately six to eight minutes and the high pressure turbine shaft will come to rest in approximately 15 minutes. Provisions are included to run the d-c pumps for approximately 30 minutes after the unit comes to rest to keep the bearings cool. Restarting can take place at any time after both shafts come to rest.

Control and Valving

The gas turbine will usually be operated so that the speed is varied to maintain compressor discharge pressure. Maximum exhaust temperature and maximum speed are over-riding controls. A selector switch is provided so that the unit can be placed on manual speed control if desired. Where more than one turbine is installed in a station, it is expected to operate only one unit on automatic discharge pressure control with the remaining units on manual speed control. The control system is flexible so that as experience indicates the actual operation can be changed.

The valving diagram of an individual centrifugal compressor is shown in *Fig. 11*. The simplicity of the station piping is possible because the complete flow of the line goes through each centrifugal compressor and for a multiple unit station the compressors are placed in series. The main gas valves are operated from gas line pressure. They are electrically pilot-operated, with extreme travel limit switches in order to provide for automatic operation of the station.

PIPELINE NEWS

FPC Approvals Assure Gas For Carolina Markets

Construction of additional pipeline facilities to bring natural gas into the Carolinas has been authorized by the FPC, and Transcontinental Gas Pipe Line Corp., Houston, has been directed to supply a total of 24,163 Mcf per day to certain companies and communities.

The commission's order authorizes Carolina Natural Gas Corp., Charlotte, to build 67.5 miles of line, consisting of two sales lateral systems connecting with points on Transco's line. The Hickory lateral will serve Hickory, Newton, Conover, Granite Falls, Lenoir, Lincolnton, and the Statesville Brick Co., all in North Carolina. The Lexington lateral will serve Lexington, Thomasville, and the Cunningham Brick Co., also in North Carolina. The order allocates a maximum of 3235 Mcf per day to Carolina Natural.

Public Service Co. of North Carolina Inc., Gastonia, received approval for a series of five sales lateral systems, totaling 169 miles. Four will connect with Transco's line and one with the system of Piedmont Natural Gas Co., Spartanburg, S. C. Public Service will receive 16,385 Mcf maximum and will serve these North Carolina towns: Raleigh, Durham, Chapel Hill, Concord, Kannapolis, Gastonia, Dallas, Statesville, Asheville, Fletcher, Enka, Bessemer City, Davidson, Cornelius, Carrboro, Forest City, Caroleen, Cliffside, Henrietta, Rutherfordton, Spindale, Ranlo, China Grove, Mooresville, Cary, Shelby, and Troutmans.

In addition, FPC allocated Transco gas to Carolina Central Gas Co., Hendersonville, N. C. (510 Mcf), and to the South Carolina towns of Clinton (1272 Mcf), Newberry (1184 Mcf), and Blacksburg (298 Mcf). Carolina Central will build 2.5 miles of line; Laurens will construct 19.5 miles; Clinton and Newberry will jointly build 49.6 miles; and Blacksburg will construct 1900 ft of line.

The order included authorization for Piedmont Natural to build facilities to transport gas through its Greensboro-Burlington lateral for Public Service. Piedmont will substitute larger pipe and build a metering station.

Estimated cost of the various construction projects is: Carolina Natural, $936,334; Public Service, $4,533,282; Piedmont, $812,800; Laurens, $402,345; Clinton and Newberry, $970,000; and Blacksburg, $2330.

New Loops, Laterals to Up TGT System to 1395 MMcf

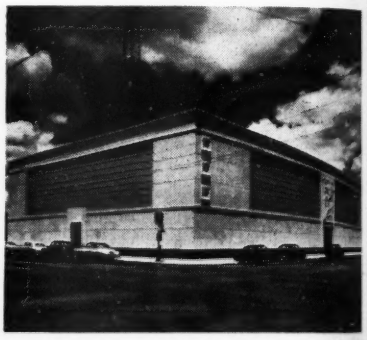
An expansion program designed to increase the daily design delivery capacity of Tennessee Gas Transmission Co.'s (Houston) system from 1310 MMcf to about 1395 MMcf has been approved by the FPC. The commission also authorized Tennessee and United Natural Gas Co., Oil City, Pa., to build facilities necessary to develop an underground storage area for natural gas in the Hebron field, Potter county, Pa.

Facilities to be built by Tennessee include 419 miles of 26- and 30-in. loop along its presently authorized system, 142 miles of 24-in. line, and 200 miles of laterals; 54,100 hp at existing and authorized stations, and 21,120 hp at a new station in Hebron field.

The new facilities will be used to transfer 25 MMcf daily to Manufacturers Light & Heat Co. and 15 MMcf each to Iroquois Gas Corp., Equitable Gas Co., and United Natural. The remaining volumes will provide part of the cushion gas for operation of the Hebron field, and sales to United, Equitable, and Iroquois will be subject to curtailment if more gas is required for development of the storage field.

A portion of Tennessee's application, including 162 miles of new line, 109 miles of loop, and 3000 hp, was denied. Estimated cost of all the facilities proposed by Tennessee, including those denied, is $94,869,000. The storage project, to be owned jointly by Tennessee and United Natural, represents $7.4 million of this amount.

The approval is conditioned to require the sale of up to 1 MMcf daily to Republic Light Heat & Power Co., Buffalo, and up to 3519 Mcf daily to the city of Clarksville, Tenn. These amounts are to be taken from unsold and unallocated capacity previously authorized by FPC. The certificate was to become effective upon written accep-



The second anniversary of Transcontinental Gas Pipe Line Corp.'s groundbreaking for its Texas-to-New York City pipeline was celebrated in May with the opening of its new home office building in Houston.

Brick faced with no exterior windows, the building also boasts 72,500 sq ft of office area, 6000 sq ft of basement machinery area, 17,500 sq ft devoted to a 60-car garage, and 17,600 cu ft of vaults.

Outstanding features of the new headquarters are its gas-fired air conditioning system, which circulates some 93.6 million cu ft of conditioned air per day, and a 300-ft tower at the rear which provides the Houston office with a microwave system paralleling the entire 1840-mile line and linking it with the gas control station in Linden, N. J., 19 compressor stations, and mobile field crews operating by car or plane.

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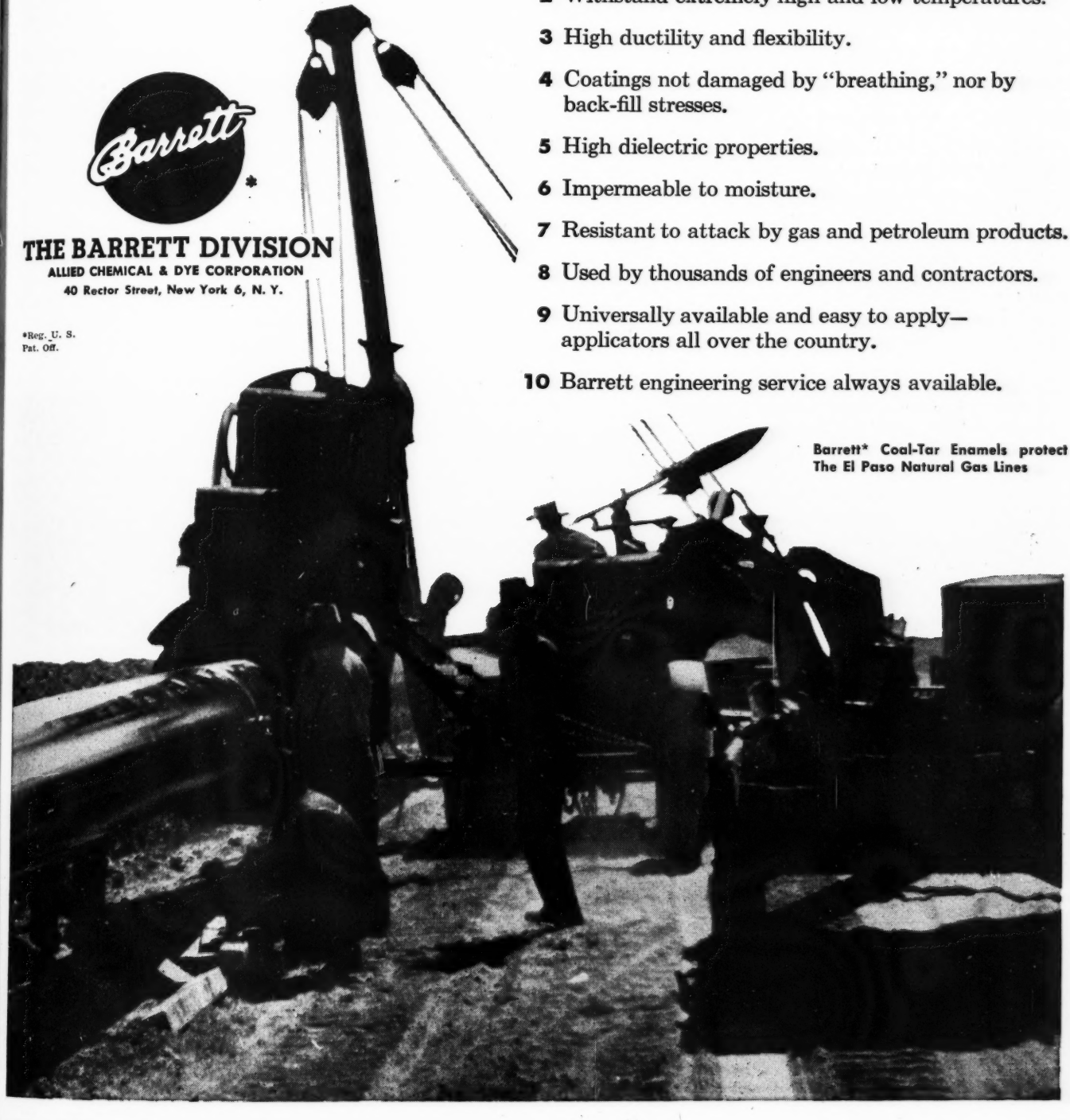

Barrett* Coal-Tar Enamels protect The El Paso Natural Gas Lines

tance by Tennessee, since the company had expressed unwillingness to accept any certificate not authorizing all its proposed facilities.

Three Southeastern Plans Dismissed for Want of Gas

Three proposals to construct natural gas transmission systems in the South have been dismissed by the FPC because the applicants have no firm gas supply. The firms—South Georgia Natural Gas Co., Atlanta; South Central Alabama Gas Co. Inc., Birmingham; and Georgia Natural Gas Co., Albany, Ga. —all sought FPC orders directing Southern Natural Gas Co. to supply gas for their projects. In addition, South Georgia also applied for gas from Transcontinental Gas Pipe Line Corp. as an alternative.

In April, South Georgia and South Central amended their applications by withdrawing requests for orders directing Southern Natural to connect with their systems because the latter company had said it would apply for additional facilities in 1952 and would be glad to consider their requirements. Georgia Natural, the commission decided, is not engaged or legally authorized to engage in local distribution of gas; therefore, its entire proposal was dismissed.

Facilities which had been planned by the three firms consisted of the following: South Georgia—527 miles of line to supply markets in Georgia and Florida. Cost: $10.5 million if Southern Natural supplied the gas, $12,080,000 (and an extra 53-mile connection) if Transco supplied the gas. South Central Alabama—150-mile line to serve south central Alabama. Cost: $2.5 million. Georgia Natural—Phenix City, Ala. to Tallahassee, Fla. with laterals to principal towns in southwest Georgia. Cost: $5.1 million.

El Paso in Court Test of Common Carrier Concept

Whether the Natural Gas Act of 1938 in effect "repealed" certain portions of the 1920 mineral lease law was being debated last month as El Paso Natural Gas Co. carried its dispute with the U. S. Department of the Interior over the department's "common carrier" stand to the U. S. District Court in Washington, D.C.

Hearings in the case, whose outcome may determine whether a number of Arizona customers, in particular, will have gas to keep them warm next winter, got under way June 13. Until the matter is settled, El Paso cannot lay the last 32 miles of a 450-mile, $45 million line from the San Juan basin in the four corners of Utah, New Mexico, Colorado, and Arizona to the California border. The 32 miles in question are located on public lands.

El Paso claims Secretary Chapman first agreed to grant rights-of-way, then refused when El Paso would not agree to carry gas other than its own.

The question of El Paso's common carrier status had previously been considered by FPC in its certification proceedings, and while FPC had recognized the legal burden imposed by the mineral lease law, which stipulates that a pipeline crossing public lands is a common carrier, it had refused to force El Paso to file common carrier rates.

El Paso wants to put Interior out of the picture and eliminate the double jurisdiction. Concurrently a bill to accomplish the same purpose is under consideration in Congress (*GAS*, June 1951, p. 21).

East Ohio—New York State Storage Idea Approved

East Ohio Gas Co., Cleveland, and New York State Natural Gas Corp., New York, have been authorized by FPC to construct and operate natural gas facilities including pipelines in Ohio and Pennsylvania and a storage area in Pennsylvania.

The order approves New York State's acquisition from Peoples Natural Gas Co. of the South Bend (Pa.) storage area and construction of facilities necessary for the storage project, as well as a 77-mile, 20-in. line from there to the Ohio-Pennsylvania state line in Lawrence county, Pa., 17 miles of field lines, and a 12,000-hp compressor station in the storage area. Additional gas available from this project will be delivered to Peoples Natural and East Ohio.

A 65-mile, 26-in. line to connect with New York State's authorized line, and extending to Summit county, Ohio, was authorized for East Ohio. Cost of New York's project is estimated at $8,969,100; East Ohio will spend $4,382,170.

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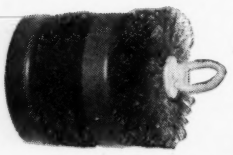
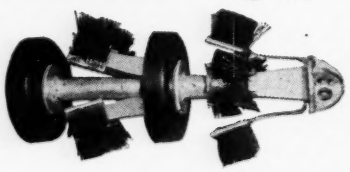


4" Size—TYPE JRN. 2" to 4" sizes. Will pass 1½ R-90° Bends. No valves other than full diameter thru port valves. Use TYPE SCN-51 for 6" size.



8" Size - TYPE WC-11. 8" to 14". Will traverse 6-foot radius field bends, full diameter side openings at 45°. SPRINGS COMPENSATE for BRUSH WEAR.

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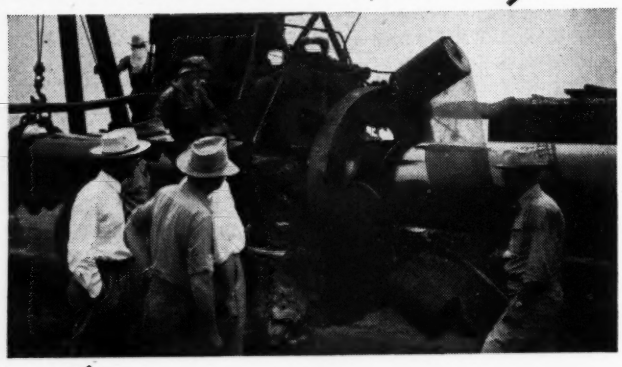

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Failure to Prove Case Kills Aging Atlantic Gulf Plan

Atlantic Gulf Gas Co., Shreveport, which was seeking authority to build natural gas transmission facilities to serve areas of Georgia, Florida, South Carolina, and Alabama, has had its application denied by the FPC because it "has not shown that it is able and willing properly to do the acts and to perform the service proposed in its application . . ."

The application was filed in April 1947 and the commission three times reopened the hearings to permit Atlantic to prove its case. At the latest hearings, held May 14 and 15, the company's witness said the project, as presently designed, cannot be financed and could not be operated economically on the basis of business under contract. Redesign of the project, said Atlantic's counsel, would entail further studies requiring more time.

Atlantic was proposing to build about 1731 miles of line from southeastern Louisiana through Mississippi, Alabama, Georgia, South Carolina, and northern Florida. Most recent cost estimate was $98,700,000. The company would have served 53 communities and 22 direct industrial customers.

In a concurrent order, FPC denied an application by United Gas Pipe Line Co., also of Shreveport, to build facilities to sell and deliver gas to Atlantic.

Texas Price Fix Try Fails

A bill to empower the Texas Railroad Commission to fix minimum wellhead prices for natural gas expired last month after a brief but explosive trip through the state's legislature.

Eulogy was delivered by the Texas Independent Producers & Royalty Owners Assn., which heralded the bill as a powerful publicity agent which had "done much" to direct public attention to the matter.

The measure would have been established as a conservation agent, to be wielded by the commission as it saw fit, subject to public hearings.

NO AFFILIATION

Harold C. Price, president of H. C. Price Co., of Bartlesville, Okla., has issued the following statement:

An announcement recently appearing in a number of industrial publications* states that a newly organized pipeline contracting firm "is in effect a merger of the talents and key personnel" of H. C. Price Co. and another contracting company. This tends to give the impression that H. C. Price Co. is affiliated with the new organization.

We wish to definitely state that neither H. C. Price Co., nor any of its personnel, has any connection whatsoever with this new company, and it is to correct any such misconception that this statement is being issued.

*Not including GAS.

Eminent Domain Storage Bill Passes in Illinois

Illinois gas utilities in general, and the Peoples Gas Light & Coke Co. of Chicago and its subsidiaries in particular, last month won a victory for their customers when the state legislature approved a bill extending the power of eminent domain to the condemnation of subterranean storage space and cleared the way for Peoples tests for suitable formations in Kankakee county.

Peoples badly needs storage space if it is to satisfy future peak load demands. A backlog of 90,000 spaceheating customers is being reduced at a rate of only 3000 a month. Completion of the Texas-Illinois Natural Gas Pipeline Co. carrier will fall short of meeting needs unless an adequate storage field is developed. (*GAS*, April 1951, pp. 105-106).

Peoples recently estimated that as an alternative six more pipelines would be required to satisfy demands of the several companies in the area.

Pipeline companies already had the power of eminent domain in pipeline construction.

Coalmen waged a stiff battle to prevent the measure's passage.

Gas Gathering Tax Bill Wins in Texas Legislature

Beginning Sept. 1, gas gathered in Texas for pipeline use will be taxed 9/20ths of a cent per Mcf, the state legislature decided last month. Thus was settled, for this session, the question of whether natural gas' share of the state's fiscal burden should be increased, and how.

For several weeks the lawmakers had argued over whether the 5.7% production tax, already in effect, should be increased or whether the extra levy should be placed upon gas gathering — or whether both sources should be tapped. The final vote retained the production tax at its old level as well as setting up the new one.

Legality of the gathering tax, which is expected to reap about $14 million a year, had some of the legislators worried on the basis that it might be thrown out in a court test as a burden on interstate commerce.

The new tax hits pipeline companies and their customers, is a victory for royalty owners and producers who would have been forced to stand the costs of a higher production tax.

Transco Lacks Gas for Two Projects, FPC Finds

The Federal Power Commission has found that Transcontinental Gas Pipe Line Corp., Houston, does not have available natural gas to supply Lynchburg (Va.) Gas Co. and Delaware Power & Light Co., Wilmington, and has denied four applications relating to this proposed service.

Proposals denied were (1) Lynchburg Gas Co., seeking an order directing Transco to supply it with natural; (2) Lynchburg Pipe Line Co., a subsidiary of Lynchburg Gas, for a 15-mile line connecting Transco's system with Lynchburg Gas' facilities; (3) Transcontinental, for a ½-mile line and

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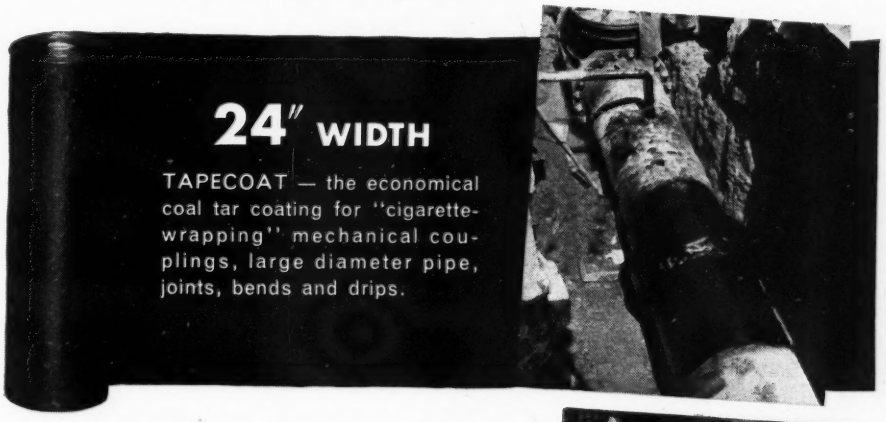
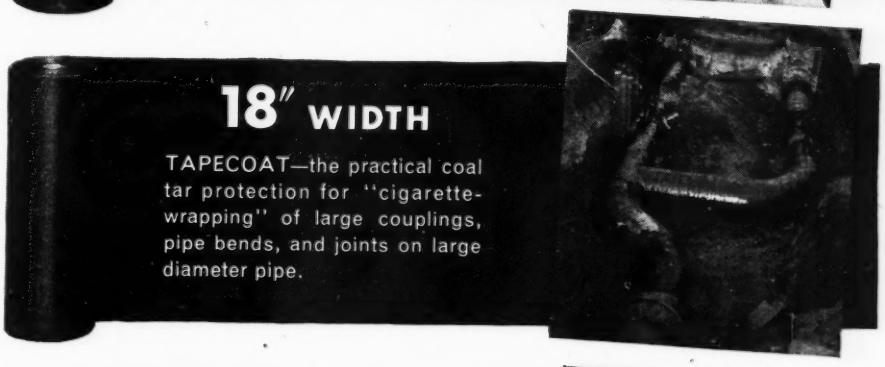


24″ WIDTH

TAPECOAT — the economical coal tar coating for "cigarette-wrapping" mechanical couplings, large diameter pipe, joints, bends and drips.



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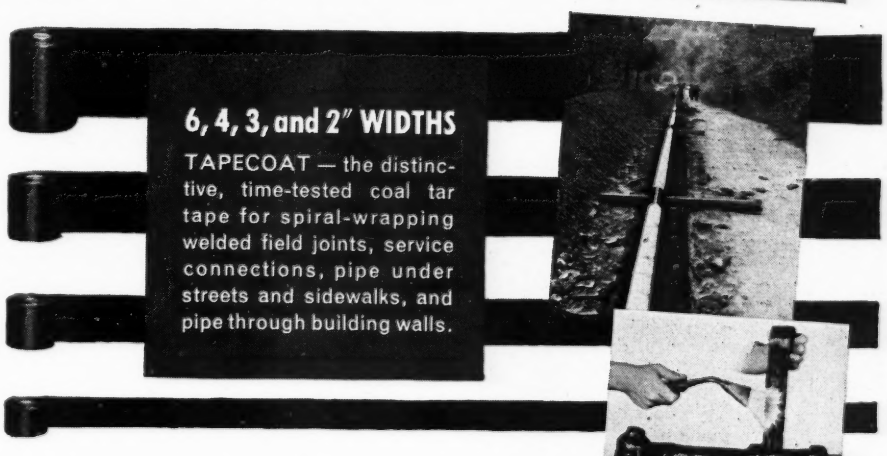
TAPECOAT—the practical coal tar protection for "cigarette-wrapping" of large couplings, pipe bends, and joints on large diameter pipe.



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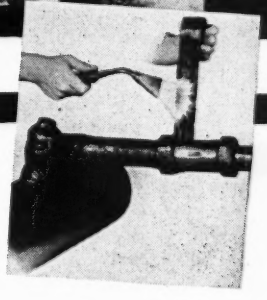

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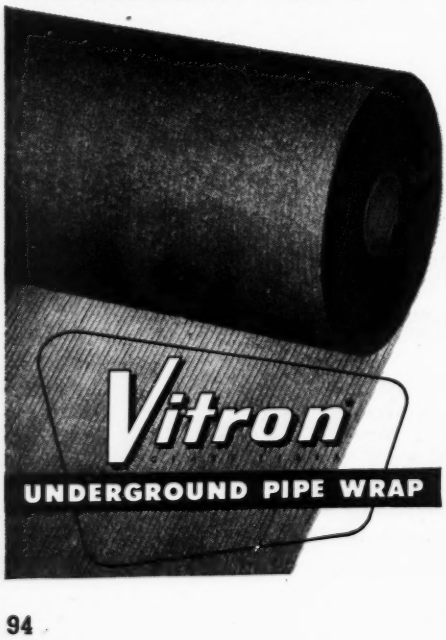


meter and regulator station for delivery of gas to Delaware Power; and (4) Philadelphia Electric Co., for authority to abandon certain facilities to the extent that they are used to transport and sell gas to Delaware Power. Philadelphia proposed to relinquish up to 3.7 MMcf of the gas it now receives from Transco.

Transco's authorized daily delivery capacity is 555 MMcf, FPC said, all of which is needed to meet authorized demands.

Virginia Gas Plea Denied

Late in May, an FPC presiding examiner filed an initial decision, subject to commission review, dismissing the application of Sotuhwestern Virginia Gas Transmission Co., Martinsville, Va., seeking gas from Transcontinental Gas Pipe Line Corp. for transportation through a line the Virginia company is proposing to build.

The examiner found that the company is not a qualified applicant under the Natural Gas Act since it is not engaged or legally authorized to engage in the local distribution of natural gas to the public.

Southwestern Virginia wants to build a 16.8-mile, $229,250 line from a point on Transco's system north of the North Carolina-Virginia state line to a point near Martinsville.

SoCal Plans Rural Line

FPC authorization for a 35-mile natural gas line extending into the Anteolpe valley in southern California is being sought by Southern California Gas Co., Los Angeles.

The proposed line would supply natural to Mojave, Lancaster, and Palmdale, which new receive LP-Gas, and to Rosamond, which has no gas service.

Estimated annual sales are 140,980 Mcf in the first year, 233,814 Mcf in the fifth. Cost for transmission and distribution facilities by the fifth year is set at $690,779.

Pipeline Newsnotes

Petitions for rehearing and oral argument filed by Consolidated Edison Co., Brooklyn Union Gas Co., and Kings County Lighting Co., all of New York, in connection with an FPC order of April 4 authorizing certain construction, have been granted by the commission. FPC also consolidated in the proceedings a similar case in which the three companies were granted a rehearing of an order of Oct. 31, 1949. The New York firms contend, in both cases, that the commission does not have jurisdiction. Time and place for the oral argument have not been fixed.

An application of Manufacturers Light & Heat Co., Pittsburgh, proposing the construction of 172 miles of line extending from prospective gas fields in Clinton county, Pa. to an interconnection with the firm's existing system in Washington county, has been denied by the FPC for lack of a proved gas supply. Manufacturers was relying upon discoveries of gas to be made in 33 untested domes near the route of the proposed line to supply the facilities. Commissioner Buchanan dissented. The company announced that it will seek state public utility commission approval of the project.

United Gas Pipe Line Co., Shreveport, has received the FPC's okay to withdraw an application in which it proposed to add 21,280 hp of compressor facilities on its 30-in. line now under construction from Eugene Island off the coast of Louisiana to near Kosciusko, Miss. The facilities would have upped capacity of the line by 101 MMcf daily, which was to be sold to Southern Natural Gas Co. United will supply Southern Natural from other sources.

Shortage of steel is the principal factor delaying decisions on proposals for both gas and oil pipelines between Alberta and the Pacific Northwest, Bruce K. Brown, PAD deputy administrator, recently told Rep. Hugh B. Mitchell in Washington. Mr. Mitchell, not satisfied with the explanation, said the shortest line would require only 204,000 tons of steel, or less than .2% of production.

PROGRESS REPORTS

Planned

ARKANSAS-MISSOURI POWER CO., Blytheville, Ark. To build line from Big Inch to serve 12 towns in two states. To start within year.

ASSOCIATED NATURAL GAS CO., Tulsa. Docket G-1689 for 88 miles of line, town border and distribution regulator stations and distribution facilities to serve 14 towns in Missouri.

ATLANTIC SEABOARD CORP., Charleston, W. Va., for a 3520-hp station in Randolph county on its Cobb-Rockville line.

CENTRAL KENTUCKY NATURAL GAS CO., Charleston, Docket G-1666 for 18.6 miles of 12¾-in. from Winchester to Lexington, Ky.

CENTRAL KENTUCKY NATURAL GAS CO., Charleston, Docket G-1648 for 12.8 miles 20-in. loop northeast from North Means, Ky.

CENTRAL WEST UTILITY CO., Kansas City. Docket G-1682, four alternate plans to serve Clay county, Mo.

CITIES SERVICE GAS CO., Oklahoma City. Docket G-1704 for a 10-mile, 26-in. line between its Welch and Ottawa stations in Franklin county, Kan.

CITIZENS GAS CO., Stroudsburg, Pa., **BANGOR (PA.) GAS CO., PEN ARGYL GAS CO.**, subsidiaries of Penn Fuel Gas Inc., laterals to receive gas from Manufacturers Light & Heat Co.

COLORADO INTERSTATE GAS CO., Colorado Springs, 30 miles 20-in. loop from Elbert county to Limon, Colo., 19 miles 6⅝-in. lateral in Fort Lynn, Colo., connecting system to recently authorized 216-mile line; increase Panhandle compressor station capacity from 4800 to 6600 hp; install additional 1320-hp unit at Kit Carson, Colo.

EAST TENNESSEE NATURAL GAS CO., Knoxville. Dockets G-1065 and G-1517 for three laterals totaling 8 miles, together with physical connections, metering measuring, and regulating equipment.

EL PASO NATURAL GAS CO. Docket G-1629 for 10.4 miles 30-in., 36 miles field lines, 37,160 hp in main line stations, 18,910 hp in field stations, field gathering systems, and miscellaneous facilities.

EL PASO NATURAL GAS CO. Docket G-1631 for 112.9 miles 30-in., 179.5 miles field lines, 98,200 hp added capacity plus 36,540 hp in field stations, field gathering systems, and miscellaneous facilities.

EL PASO NATURAL GAS CO. Docket G-1630 for 25,050 hp at new and existing stations, 50.9 miles field lines, 2700 hp at a field plant, gas wells and miscellaneous facilities.

GULF-MICHIGAN GAS TRANSMISSION CORP., St. Louis, for 680-mile, 30-in. line from Perryville, La. to St. John, Ind. with three compressor stations totaling 30,800 hp.

KANSAS-NEBRASKA NATURAL GAS CO., Hastings, to build 117 miles of 2⅜-, to 8⅝-in. line in Nebraska, four town border stations and laterals, measuring and regulating equipment.

MICHIGAN CONSOLIDATED GAS CO., 180-mile, 24-in. line paralleling present line from storage fields at Austin, Mich. to Detroit.

MICHIGAN GAS STORAGE CO., Jackson, for 78 miles of 16-, 22-, and 24-in. line from Laingsburg Junction to near Pontiac-Mt. Clemens, 3 laterals, 7400 hp, and 30 miles 26-in. loop. All for development of the Riverside storage field.

MISSOURI CENTRAL NATURAL GAS CO., Macon, Mo., 25 miles of 6-in. from Moberly to Macon, Mo.

MONTANA POWER CO. Butte, 8-in. line from Hart Mountain field, Wyo. to Warren, Mont. and convert an oil line from Warren to Billings.

NATIONAL UTILITIES CO. OF MICHIGAN, Coldwater, Mich., 77 miles in south central Michigan.

NEVADA NATURAL GAS PIPE LINE CO., 114 miles of 10¾-in. line from Topock, Ariz., to Henderson, Las Vegas, and North Las Vegas, Nev.

NEW RIVER GAS CO., Radford, Va., 50-mile line from Atlantic Seaboard's system in W. Va. to a point near Radford with laterals to four towns.

NEW YORK STATE NATURAL GAS CORP., Pittsburgh, Docket G-1701 for a 6600-hp station at Dryden, N. Y. and 35.2 miles 20-in. loop from there to the Therm City station.

NORTHERN INDIANA FUEL & LIGHT CO., Auburn, Ind., 33-mile, 8⅝-in. line to carry gas to northeastern Indiana.

NORTHERN NATURAL GAS CO., Omaha. Dockets G-1442 and G-1511 for 13.9 miles of branch and a measuring and regulating station near Humboldt, Iowa and 1.5 miles of branch and a similar station near La Platte, Neb.

NORTHWEST NATURAL GAS CO., for 700 miles in Washington, Idaho, Oregon.

OHIO FUEL GAS CO., Columbus, Docket G-1639 for 61.3 miles in Sandusky, Elyria, and Dayton, Ohio areas.

PACIFIC GAS & ELECTRIC CO., San Francisco. Docket G-1651 for 141 miles 34-in. loop and 22,780 hp at authorized stations.

PACIFIC GAS & ELECTRIC CO., San Francisco, Docket G-1709 for a 44-mile, 8⅝-in. line in Monterey county, Calif.

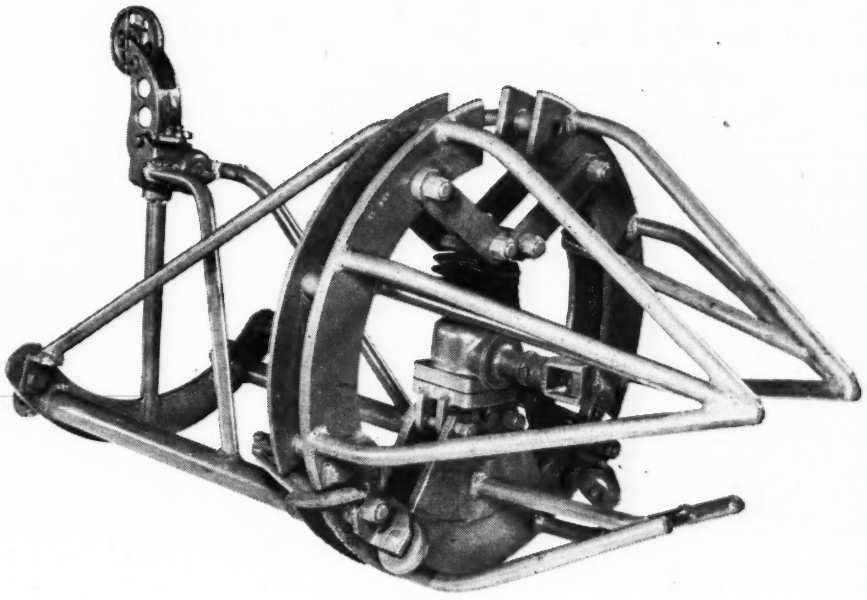
PACIFIC NORTHWEST PIPELINE CORP., 2175 miles of 26-in. from southern Texas to Seattle, Wash., Vancouver, B.C., via Oklahoma, Kansas, Colorado, Wyoming, Idaho, Oregon, Washington.

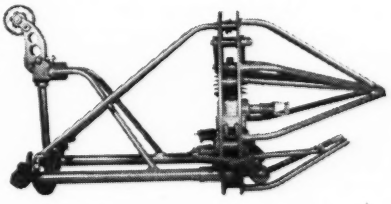
PANHANDLE EASTERN PIPE LINE CO., Kansas City, Mo. Docket G-1705 for 6000 hp at existing stations, 24.7 miles 26-in. and 7.24 miles 30-in.

PIEDMONT GAS CO. INC., Hickory, N. C. Docket G-1617 for 28 miles 6-in. line, metering and regulating stations.

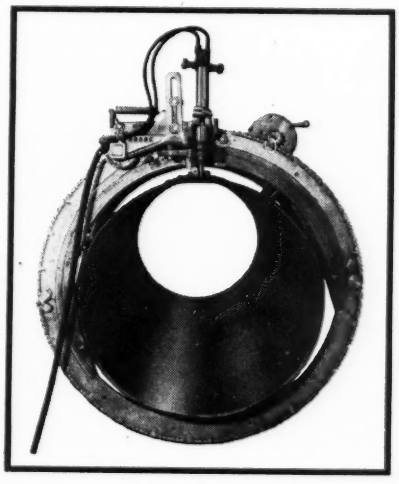
SHENANDOAH GAS CO., Lynchburg, Va., for 59 miles from near Cedarville, Va., to cities in Virginia and West Virginia.

CROSE CLAMP
INTERNAL LINEUP





CROSE INTERNAL LINEUP CLAMPS are available in manual, electric and hydraulic models for pipe sizes ranging from 12″ to 36″. Crose Internal Lineup Clamps have been proven in world-wide field operations.



CROSE PIPE CUTTING AND BEVELING MACHINE for fast true cutting and beveling of pipe. Available in six sizes for 4″ to 36″ pipe. All machines are built of high strength, lightweight aluminum alloys. The continuous ring which goes around the pipe is hinged so that these machines may be installed as easily from the side of the pipe as from the end. Machines for 16″ pipe and above have "Out-of-Round" attachment as standard equipment.

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SOUTHERN CALIFORNIA GAS CO., Los Angeles. Docket G-1698 for a 35-mile line in the Antelope valley, Calif.

SOUTHERN NATURAL GAS CO., Birmingham, 169 miles of various size pipeline and three compressor stations totaling 19,450 hp in Alabama, Georgia, Mississippi and Louisiana.

TENNESSEE GAS TRANSMISSION CO., Houston, 45-mile spur from Buffalo, N. Y. to near Niagara Falls, N. Y. Also 266 miles loops between Texas & New York, 100 miles of laterals, 72,000 hp to be added, and crossing of Niagara river.

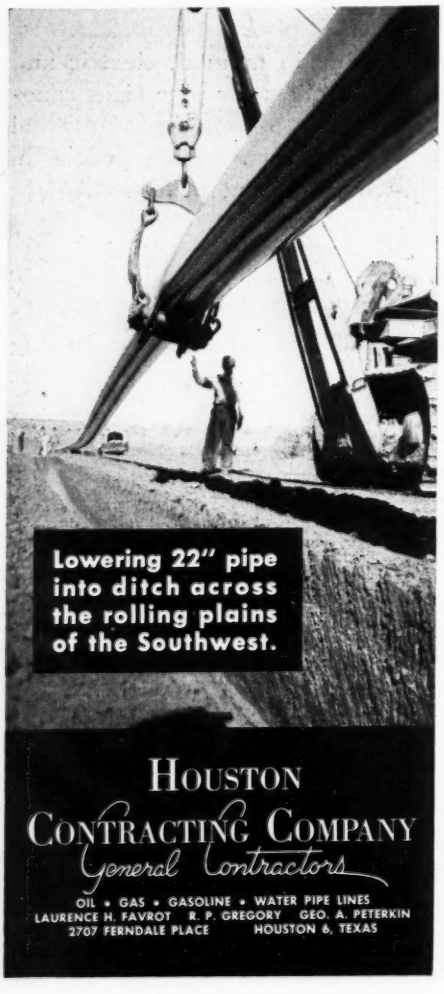
TEXAS GAS TRANSMISSION CORP., compressor station with 3960 hp on its main line near Shreveport. Also 642 miles main and loop in La., Ark., Miss., Tenn., and Ky. Includes 189-mile line from Acadia parish to Morehouse parish, La. (24- and 26-in.) and 425 miles 26-in. loops. Also 5280 hp near Madison, Ind.; 9340 hp at 4 existing stations; underwater crossings of Ohio & Mississippi.

TRANS-CANADA PIPE LINES LTD., for a 2200-mile line from Alberta to major cities as far east as Montreal.

UNITED FUEL GAS CO., Charleston, to build 45 miles in West Virginia, 2640-hp compressor station with dehydration plant, and transfer 1000-hp unit from Walgrove to Kanawha station.

UNITED NATURAL GAS CO., Oil City, Pa. for 10 miles new line and to replace and relocate 10 miles all in Elk, McKean, Venango, and Mercer counties. Add 150-hp units at Hickory and Pinegrove stations and a generator at Knox station.

UTAH NATURAL GAS CO. to build a 360-mile line from the San Juan basin to Salt Lake City. A secondary line would run from Last Chance field (Wayne county, Utah) through Sevier and Sanpete counties.



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UTAH PIPE LINE CO., Dallas, for a 392-mile line from Aztec, N. M. to Salt Lake City. Includes 374 miles of 22-in. and 18 miles of 16-in.

WESTCOAST TRANSMISSION CO. INC., Wilmington, Del., 615 miles, including 277 miles from Sumas, Wash. to Portland, Ore. with short branches to a number of cities in the two states; 266 miles south from the Osoyoos, B. C. area to Spokane and Hanford, Wash.; and 72 miles of laterals and 13 measuring stations.

Approved

CAROLINA NATURAL GAS CORP., Charlotte, N. C. Docket G-1335 for 67.5 miles, consisting of two sales laterals to Transcontinental Gas Pipe Line Corp.'s system.

CITIES SERVICE GAS CO., Oklahoma City, has Cheek Construction Co. at work on 100 miles of 4-, through 20-in. gathering system east of Ulysses, Kan.

CITIES SERVICE GAS CO., Oklahoma City, for 56 miles of 16-, 10-, and 3-in. line in Kansas and 13,080 hp at new and old stations.

COLORADO-WYOMING GAS CO., Denver. Docket G-1534 for lateral lines and meter stations to supply gas to Public Service Co. of Colorado, its parent; add 2400 hp at its Mesa compressor station; replace 1½ miles of its Fort Warren lateral with larger pipe; and replace 4 miles of 4-in. (Golden lateral) with 8-in.

EAST OHIO GAS CO., Cleveland. Docket G-1571 for a 65-mile, 26-in. line from near Petersburg, Ohio to Cleveland.

MISSISSIPPI RIVER FUEL CORP., St. Louis, for a 98-mile, 16- and 18-in. feeder line from Lincoln parish, La. to Woodlawn, Texas, gas field. Also 11-mile, 10-in. lateral to Waskom field, Texas.

MONTANA-DAKOTA UTILITIES CO., Minneapolis, 16 miles connecting lines between facilities acquired from 3 companies in Montana and Wyoming. Compressor station with two 330-hp units and dehydration facilities, together with addition of two 880-hp units to an existing compressor station.

NEW YORK STATE NATURAL GAS CORP., Pittsburgh. Docket G-1622 for a 39-mile, 20-in. line from Potter county, Pa. to the boundary between Livingston and Monroe counties, N. Y.

NEW YORK STATE NATURAL GAS CORP., Pittsburgh. Docket G-1601 for a 77-mile, 20-in. line from Lawrence county Pa. to the South Bend storage area, 17 miles of field lines, and a 12,000-hp station.

OHIO FUEL GAS CO., Columbus, Docket G-1594 for 74 miles storage project lines, 47½ miles 20-in. from proposed storage areas to markets, and 8480 hp for storage service. In Ashland, Hocking and Knox counties, Ohio.

PUBLIC SERVICE CO. OF NORTH CAROLINA INC., Gastonia, Docket G-1407 for 169 miles of laterals to Transcontinental and Piedmont Natural lines and 25 distribution systems in North Carolina.

TENNESSEE GAS TRANSMISSION CO., Houston. Docket G-1614 for 89,530 ft of line and appurtenant facilities and 21,120 hp in a new station in Hebron field, Potter county, Pa. Joint project with United Natural Gas Co., Oil City.

TENNESSEE GAS TRANSMISSION CO., Houston. Docket G-1573 for 419 miles 26- and 30-in. loop, 142 miles 24-in. line, 200 miles laterals, and 54,100 hp at existing and authorized stations.

TRANSCONTINENTAL GAS PIPE LINE CORP., Houston. Docket G-1685 for 7200 ft of 12¾-in. line and appurtenant facilities for Delaware river crossing near Marcus Hook, Pa.

UNITED NATURAL GAS CO., Oil City, Pa. Docket G-1614 for 89,530 ft of line and appurtenant facilities and 21,120 hp in a new station in Hebron field, Potter county, Pa. Joint project with Tennessee Gas Transmission Co.

Under Way

ALGONQUIN GAS TRANSMISSION CO., Boston, facilities to serve designated companies in Mass., R. I., Conn., and N. J. Includes 253 miles of main line and 279 miles of laterals.

CITIES SERVICE GAS CO., Oklahoma City, has Knupp Construction Co. Inc., at work on 29 miles 16-in., Wichita to Newton; taking up 60 miles 6-, 8-, and 10-in. near Newton.

COLORADO INTERSTATE GAS CO., Colorado Springs, a 215-mile, 20-in. line from the Texas Panhandle to Colorado.

EL PASO NATURAL GAS CO., 451 miles 24-in. main from San Juan county N. M. to Topock, Ariz., related plant facilities, gathering lines and laterals. Also a compressor station near Ganado, Ariz. and a gasoline treating compressor plant near Fruitland, N. M.

EQUITABLE GAS CO., Pittsburgh, Poston Construction Co. at work on 15 miles 16-in. on north and west sides of Pittsburgh.

GRAND VALLEY PIPELINE CO., Denver, a 105-mile, 8- and 10-in. line from Piceance creek to Grand Junction and Rifle, Colo.

HOPE NATURAL GAS CO., Clarksburg, W. Va., has Pipe Line Construction & Drilling Co. working on 34 miles of 8-, 10-, and 12-in. line from Fairmont, W. Va. to Terra Alta, W. Va.

HUGOTON PRODUCTION CO. has Reese Bros. Construction Co., Hugoton, Kan. at work on a 45-mile, 3- to 22-in. gathering system in the Hugoton gas field, 20% completed.

INTERSTATE POWER CO., Dubuque, Iowa. 26½-mile 8⅝-in. line to the Clinton, Iowa area. Includes a submarine crossing of the Rock river and a double submarine crossing of the Mississippi.

KANSAS NEBRASKA NATURAL GAS CO. INC., Hastings, Neb., has Engineers Limited Pipeline Co. working on submerged crossings of the Loup and Cedar rivers in Nebraska.

LAKE SHORE PIPE LINE CO., Cleveland, Ohio, 45-mile, 10¾-in. line from Meadville, Pa. to Ashtabula, Ohio.

NEW YORK STATE NATURAL GAS CORP., New York. Williams Austin Co., Pittsburgh, is at work on 82½ miles 20-in. from Utica to Ithaca and 12 miles 16-in. from Knox to Schenectady, N. Y.

NIAGARA MOHAWK POWER CORP., Syracuse, under Docket G-1311 has Williams-Austin Co., Pittsburgh, at work on 40 miles of 10-, 12- and 16-in. laterals.

NIAGARA MOHAWK POWER CORP., Syracuse, under Docket G-1475 is building a 55-mile 10¾-in. line to supply Watertown and other communities.

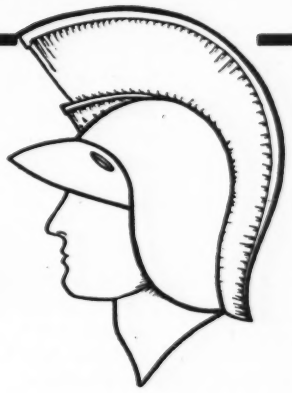
NORTHEASTERN GAS TRANSMISSION CO., Springfield, Mass. 500 miles of line from Tennessee Gas Transmission Co.'s system near Pittsfield, Mass., and from Transcontinental's system near Greenwich, Conn. and metering and regulating facilities. To serve companies in Conn., Mass., and N. H. Includes 144 miles 24-in. from Pittsfield to Wakefield, Mass. to be built by Oklahoma Contracting Co.; 100 miles 16-in. from Greenwich, Conn. to Springfield, Mass. to be completed by Aug. 1 by Britton Contracting Co. Inc.; and 225 miles 3- to 12-in. laterals and 35 meter stations, all to be constructed in 1951. About 35 miles 24-in. completed in western Massachusetts running toward the New York state line.

NORTHERN NATURAL GAS CO., Omaha, has Reese Construction Co. at work on 181 miles of 4- to 16-in. gathering system in Hugoton, Kan. To be completed Dec. 31. R. H. Fulton & Co. on 24-in. underground crossing of Cimaron river, Ulysses, Kan.

PACIFIC GAS & ELECTRIC CO., San Francisco, has Bechtel Corp. building compressor stations at Topock, adding 6 compressors totaling 15,000 hp; Hinkley, adding 7 compressors totaling 17,

On every job, we emphasize

Personal Supervision



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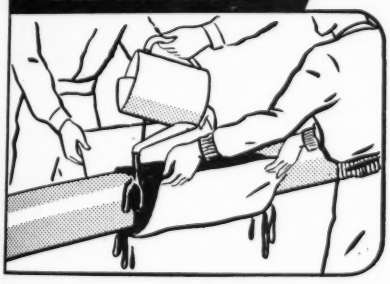
MODERN EQUIPMENT • EFFICIENT PERSONNEL • FINANCIAL STABILITY

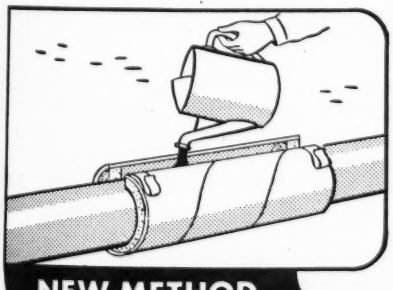
FIELD JOINTER

PAT. APPLIED FOR

Slip on - Pour full - Lower in

OLD METHOD





NEW METHOD

"Field - Jointer" construction features heavy, rigid, paper mould equipped with felt inserts for each end, preventing waste, plus heavy adhesive tape fasteners. One - quarter inch spacing between pipe and mould gives positive assurance of protection. Slip on — pour full — Lower in.

The "Field-Jointer" represents a new technique of coating field joints and skid-marks with the same material used on pipe at the coating machine. Slip-on "Field-Jointer" over joint, pour enamel, fasten, and you are ready to lower-in. The canvas sling method is slower, and does not provide assurance of adequate protection for pipe bottoms. Use of "Field-Jointer" provides following features for field use:

- ★ Eliminates waste of material
- ★ Eliminates clean-up operations
- ★ Operates simply requiring no skilled labor
- ★ Affords positive proof of pipe-bottom protection
- ★ Prices and additional information, plus arrangements for field demonstrations furnished on request.

CONTACT US DIRECT OR:

Line Products Corp., Foot of Magnolia Ave., Elizabeth, N. J.
S. D. Day Co., 1973 W. Gray, Houston Texas
Mel Maddox, P. O. Box 165, Little Rock, Arkansas
J. H. Longaker, 1204 Russ Bldg., San Francisco, Calif.

AMERICAN COATING SUPPLY CO.

3-8704 — Phones — 4-4333

Box 3085 — Whittier Station — Tulsa, Okla.

Is your cooling tower meeting design specifications . . . giving trouble-free operation?

Is it . . . free of accumulative algae . . . safe from structural failure . . . subject to accelerated deterioration?

Does it have . . . full decking in good repair . . . minimum drift loss efficiency?

Use these 2 Fluor Services

1. Let Fluor inaugurate a preventative maintenance program—free of charge.

2. Let Fluor inspect for needed repair—recommend on a competitive bid basis.

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2500 SOUTH ATLANTIC BLVD., LOS ANGELES 22, CALIF.

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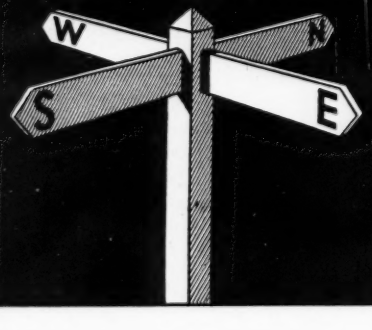
"serving all pipelines"



PIPELINE COATINGS and WRAPPING MATERIALS

S. D. DAY COMPANY

1973 WEST GRAY HOUSTON, TEXAS PHONE JU-2431

500 hp; and Kettleman Hills, adding 8 compressors totaling 12,320 hp.

PANHANDLE EASTERN PIPE LINE CO., Kansas City, has R. H. Fulton & Co. on 20 miles 24-in. and 48 miles 26-in. in five loops from Sneed, Texas, to Olpa, Kan.

PANHANDLE EASTERN PIPE LINE CO., Kansas City. Midwestern Constructors 60% complete on 3 compressor station additions.

PENNSYLVANIA GAS CO., Warren, 52-mile 12¾-in. line from Warren to Erie, Pa. and 5 new compressor units.

SOUTHERN CALIFORNIA GAS CO. and **SOUTHERN COUNTIES GAS CO.,** Los Angeles, Alex Robertson Co. and Engineers Ltd. Pipeline Co., 24 miles 30-in. encircling Los Angeles metropolitan area. To be completed Oct. 15. SoCal has J. E. Young Pipeline Construction Co. and N. P. Van Valkenburgh Co. at work on 21-mile loop from tie-in point near Simi to east bank of Santa Clara river, to be completed Sept. 15.

SOUTHERN NATURAL GAS CO. Birmingham, has Latex Co. of Georgia at work on 35.31 miles of 8⅝-, and 8¼-in. from Opelika, Ala., to La Grange, Ga.

TENNESSEE GAS TRANSMISSION CO., Houston, 303-mile extension from Erie county, N.Y. to N.Y.-Mass. line; 787 miles of loop along existing or authorized line from Texas to Buffalo; 111,680 hp in existing, authorized, or new compressor stations; 75 miles of laterals. H. C. Price Co. is building 156 miles of 24-in. line from Hamburg, N. Y. to the Onondaga-Madison county line. Houston Contracting Co. is at work on 158 miles of 30-in. line from Jones, La. to Cypress, Texas. Bechtel Constructors Inc. at work on 120 miles 24-in. from Hamburg, N. Y. to Hudson river.

TEXAS EASTERN TRANSMISSION CORP., Shreveport, to boost capacity to 1205 MMcf, 791 miles 30-in. from Kosciusko, Miss., to Connellsville, Pa.; seven compressor stations with 46,400 hp on new line, six with 52,500 hp on existing line; short lines in New York area. Williams Brothers-Davis Co. is at work on 163.6 miles of 30-in. line from Kosciusko, Miss., to the Tennessee river. Mahoney Contracting Co. at work on 30 miles of 30-in. from Union Town, Pa. to the Oakford station and 100 miles 30-in. from the Ohio river to the Kentucky river.

TEXAS GAS TRANSMISSION CORP., to develop the Alford storage field near Petersburg, Ind., a 12-mile line, 4½ miles field lines, a 1200-hp storage field station.

TEXAS-ILLINOIS NATURAL GAS PIPELINE CO., Chicago, on its 1331-mile line, Midwestern Constructors Inc., 102 miles of 30-in. from Mississippi river near Chester, Ill., to St. Elmo, Ill. 49% completed; 100 miles 30-in. from Effingham to Sibley, Ill., 92 miles 30-in. from Sibley to Joliet, Ill. 25.5% completed; Mississippi river crossing at Wittenberg, Mo. started June 1; 101 miles 30-in. Moark, Ark. to Mississippi river near Chester, Ill. 11.7% complete. Bechtel Corp. under way on 106 miles 30-in. from Texas-Ark. line to Malvern, Ark., 58.3% complete; and 74 miles 30-in. from Newport to Moark, Ark., 90% complete; on 130 miles, Malvern, Ark. to Newport, 10.2% complete. Fish Constructors Inc., Houston, is building compressor stations. H. C. Price Co. at work on 98 miles of 30-in. from Urbana to Garrison, Texas, 39% complete; also on 96 miles 30-in. from Garrison northeast to Texas-Arkansas state line near Texarkana, 25.3% completed.

TRANSCONTINENTAL GAS PIPE LINE CORP., Houston. Docket G-1518 for 17 miles 30- and 10¾-in. from Bergen county, N. J. to Paterson, N. J.

TRANSCONTINENTAL GAS PIPE LINE CORP., Houston. Docket G-1414 for an 11-mile line from East Carteret, N. J. to Brooklyn.

TRANSCONTINENTAL GAS PIPE LINE CORP., Houston. Docket G-1411 for 45,675 hp in compressor capacity at existing stations and 41 sales meter stations.

TRUNKLINE GAS CO., Houston under way on its 740-mile Louisiana-to-Illinois line, 560 miles of laterals, and 32,000 hp in main line compressor stations.

UNITED GAS PIPE LINE CO., Shreveport, 39 miles 16-in. from Baldwin county, Ala., to Escambia county, Fla.; two laterals to Saufley field. Also tap and sales meter stations.

UNITED GAS PIPE LINE CO., Shreveport, 1005 miles in Texas, Louisiana, and Mississippi. Includes 504.7 miles 30-in., 6 miles 26-in., 53 miles 24-in. from Agua Dulce field in south Texas to Monroe, La.; about 245 miles of 30, 26, 24, and 20-in. from Gulf of Mexico northeast to Jackson, Miss.; 59.6 miles from this line to near Kosciusko, Miss. Contracts have been awarded to Brown & Root Inc., Houston, for engineering, construction, and other services and to Gulf-Southern Contractors, Fort Worth, for other major work on the project. In offshore fields in Gulf of Mexico: 12.3 miles 14-in. line. H. C. Price Co. has signed a contract for the Somastic coating of 137 miles of line to be laid in south central Louisiana. Also under way are 68.1 miles of 16-in.; 25½ miles 6-, 8-, 10- and 12-in. gathering lines from fields in Plaquemines parish, La. to New Orleans.

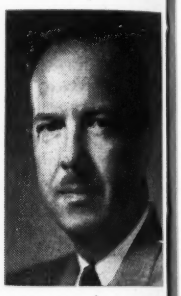
Contracts Let

NORTHERN NATURAL GAS CO., Omaha, to G. G. Griffis Construction Co. for a 217-mile 26-in. line from Palmyra, Neb. to Skellyville, Texas.

PIPELINE PEOPLE

Texas Gas Transmission Corp., Owensboro, Ky., has announced the election of W. T. STEVENSON as president, replacing J. H. HILLMAN JR., who will continue as chairman of the board of directors. Mr. Stevenson has been executive vice president and director of Texas Gas since the company was formed in 1948 and also serves as president of Western Kentucky Gas Co., Owensboro. B. C. ADAMS JR., assistant to the executive vice president since May 1950, has been elected vice president, gas supply department. He will continue as vice president of Louisiana Natural Gas Corp. and Texas Northern Gas Corp., Texas Gas' subsidiaries. EDWARD T. BOWERS, assistant comptroller of Texas Gas, has been elected comptroller.

B. C. Adams Jr.



W. T. Stevenson

ROGER D. STANWOOD, formerly affiliated with Tide Water Associated Oil, San Francisco, has joined Transcontinental Gas Pipe Line Corp., Houston, as assistant to Ionel I. Gardescu, vice president in charge of gas supply.

United Gas Pipe Line Co., Shreveport, has announced the promotion of CHARLES M. BYRNE from chief clerk at Beeville, Texas to chief clerk at Shreveport. Mr. Byrne has been associated with United Gas since 1931.